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JULY 1985

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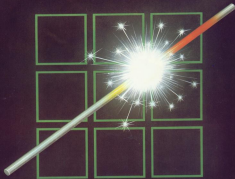
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Group Editor: Wendy J. Palmer
Editorial Assistant: Alison Hill
Software Assistant: John
Downey
Advertisement Manager: Mike
Agnew
Advertisement Copy Control:
Lucy Champion
Publishing Director: Peter
Webster
Chairman: Sir Kenneth
Cameron, Leisure Technology
Design: AAA Design

Editorial & Advertisement Office
No. 1 Golden Square,
London W1R 3AE
Telephone: 01-437 9626
Telex: 887189

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A special offer you can't refuse! We publish the complete documentation of the character designer used by Virgin to design the screens of their best-selling games, such as Falcon Patrol. We also offer the actual program to our readers at a price that really is 'virgin in the ridiculous'.



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Cheetah, sweet talk, their way into the speech synth market, and produce the world's first tail-less RAT.



COMPETITION

COMPETITION 30

Welcome aboard for another high-flyer - this month's competition. We've decided to break with the current trend by not giving away any copies of *Airwolf*. Instead we're offering one flying ace to her 'alt's desire - a copy of *Super Skatch*. And, to the runner-up, we're giving away copious copies of the latest in a long line of flight simulators - *Anting's Jump Jet*. Checko away!

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Compiled by

COMMODORE 64

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11 Zaxxon	US Gold
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13 Raid on Bungeling Bay	Artola Software
14 Pitstop 2	CBS
15 Raid Over Moscow	US Gold
16 Football Manager	Addictive
17 Spy Hunter	US Gold
18 Hunchback at the Olympics	Ocean
19 Sports	Mastertronic
20 Breakdance	CBS

Retail sales for the month ended May 3rd 1985.



VIC 20 Top Ten

TITLE	PUBLISHER
1 Rockman	Mastertronic
2 Rip the Cable	Mastertronic
3 Football Manager	Addictive Games
4 Hunchback	Ocean
5 Mickey the Bricky	Firebird
6 Vegas Jackpot	Mastertronic
7 Bullet	Mastertronic
8 Sub Hunter	Mastertronic
9 Space Invincible	Mastertronic
10 Psycho Shopper	Mastertronic

Retail sales for the month ended May 3rd 1985.

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DATA STATEMENTS



When no news might be good news

I'VE CONCLUDED THAT THE RELIABILITY of news on these pages may be attributed to one of two things - either, all the software houses in the country have gone bust, and nobody's sold us, or all the goodies are being held in store for the Summer show season.

The first show of any interest to Commodore users is the 1989 Commodore Computer Show to be held in Hammersmith on the 7th, 8th and 9th of June. 20,000 Commodore fans are expected to attend the show. Commodore are hoping to attract such a crowd with three 'three-machines-in-one' computers - the 128, on show to the British public for the first time. Other attractions will include a computer games arcade and a separate business section and even for a ... I seriously apologise in that why haven't I been asked? - not I, computer challenge competitions, prize draws and a Music

Maker orchestra.

Prize for the 'giga show' (that's even bigger than a 'mega show') of the year must go the Personal Computer World Show to be held at Olympia, London from 4-8 September. This caters for trade buyers, business and professional customers as well as all home computer users and enthusiasts. Not unlike with last year's one hall, the exhibitors will now spread their wares over two halls - home computing in the National Hall and business in Olympia 2. Commodore are already amongst those who have accepted the kind invitation to attend. The emphasis is on advice, especially to the business end of the market, which will be given through seminars and individual attention at the NCC Microsystems Centre, for example. What new offerings there will be on the home front, we shall have to wait and see.

From Uncle Sam to Ramjam

THE RAMJAM CORPORATION, creators of the excellent 64 adventure, Valkyrie 17, are to serve a three year sentence under the auspices of Nintendo. They are following in the footsteps of American companies Electronic Arts, Broderbund and Bitmaps included, but are the first British company to sign an exclusive licensing agreement with Nintendo.

Ramjam's next offering is entitled 'Three Days in Carpathia' and is supposed to be 'sophisticated, witty and very different', time will tell.

Ramjam spokesman, George Stone, is certainly happy with the new set-up. He sees it as an opportunity to stick to what he likes doing best - producing games - while the big boys get on with the job of making a profit.

Amadeus, Suite 105/106, Asphodel House, Palace Street, London W41B 1H5. Telephone: 01-628 8729.

Heath is House bound

GEOFFREY HEATH HAS SIGNED ALL-expenses-leave. Activities to Melbourne House, where he will be Managing Director and a member of the Board of Directors of the company.

Melbourne House have a staff of 10, including 20 full-time programmers, and already have a fine reputation for producing top quality software. They are hoping that Geoffrey Heath will bless their games with some of that magic which has already made Activities one of the foremost producers of software games. "We feel extremely positive about our position in this very competitive industry and ... are confident that Geoffrey's appointment will greatly benefit our company and its goals", says Alfred Milgrom, Publisher and co-founder of Melbourne House.

Melbourne House Publishers, Castle Yard House, Castle Yard, Richmond. Telephone: 01-860 6384.



Get netted

MICRONET IS DOING ITS UTMOST to entice Commodore users away from Compuserve, having realised that many Commodore 64 programs are not being distributed in an efficient and simple way, they reckon they've come up with a solution.

Micronet 800 has commissioned Y3 Computing Ltd to design a new protocol to make uploading telesoftware easier and downloading more powerful for a wider range of commercial Commodore software. Micronet believes that the new uploader has a success rate of 90%.

Many of the programs uploaded to the new protocol can still be downloaded to the new protocol and, if you bought a cartridge before the change, those generous souls at Micronet will send out new terminal software free of charge. Micronet has given details of the new protocol to a number of manufacturers producing 64 hardware and expect module manufacturers to adopt the standard.

In a further bid to attract Commodore users, Micronet has established a new communications package for the Commodore modem user. They have rewritten their Prestel terminal software for

Compuserve members to include a downloader written to the new communications protocol. Previously, Compuserve members could only obtain a Prestel terminal package that didn't download any Micronet telesoftware. But, many Commodore modem users weren't joining Compuserve so Micronet distributed a complete terminal package for the Commodore modem, thus allowing any Commodore modem user to join Micronet without joining Compuserve first.

Micronet 800, Telemap Ltd, 8 Herby Hill, London EC7R 9H, Telephone: 01-378 1041.



Sing-along-a-Micronet

MICHAEL HAS A LOT TO ANSWER FOR! Following in the wake of his stage and film debut, he is now to be immortalised on cassette or disc.

Commodore hope to teach budding musicians to play a wide range of music with the latest addition to their Music Maker software. There are three choices of albums - pop hits (including Rod Stewart, The Animals or Alvin, for example), the Beatles and popular classics. The songs are accompanied by a main track, and an instruction booklet is provided with the software.

Although the software packages have been designed for use with the musical keyboard overlay provided with the Music Maker program, each package may be used individually. Compositions may be played in one of four modes: Canon, Rhythmic, Single Key and Performance. Tuning and tempo may be selected and held. Chord, Poly and Mono modes allow the program to be linked with MIDI synthesiser keyboards. And, if you really wish no conscience battle with the neighbours, you can interface the computer with a full system.

The Music Maker 'Play Along Albums' cost £9.95 each and are available on cassette or disc.

Commodore Business Machines, 1 Hunter Road, Weldon, Corby, Northants NN16 7JG.



Winners, all

IMPOSSIBLE MISSION.


EPYX
Interactive

OUR MARCH IMPOSSIBLE MISSION competition was not impossible after all. We received over two thousand entries, most of them containing the correct password - 42128.

The first prize of Impossible Mission plus the complete CBS range (titles in all) went to Jonathan Mopley of Hudders in Humberdale. The second prizes of Impossible Mission plus three other titles went to Daniel Clarke of South-ington and A.P. Green of Gainsborough. Two third prizes of Impossible Mission plus two other titles went to Ian Langford of Totternham and S. Cherry of Hiker, and four fourth prizes of Impossible Mission plus one other title went to Nigel Cook of Ipswich, Andrew Mansford of Hockley, Christopher Packham of Teddington and Jeffrey Preece of Bournemouth.

Congratulations to all the above plus 30 other winners who will all receive one of CBS' great titles. These lucky readers are:

Andrew Wilson, Blackburn; Johnnie Singh-Quah, Wotton; M.J. Harnden, Stanford; Anthony Radon, Weyfield; Mark Bullock, Halmesbury; Simon Renoult, Southwick; Graham Peckley, Basingstoke; Mohammed Qulass, Manchester; Mark Platt, Manchester; S.R. King, Poole; John Burton, Walsley; Chris Eric Jackson, Gosport; Steven Bowler, B'ford; Mark Seal, Lincoln; Kimberley Gill, Manchester; Brian Coughlin, Co. Cork; Daniel Davis, Walsford; Richard Clow, Birmingham; Paul Call, Bradford; David McAllen, Reading; Roger Robinson, Bedford; Stephen Burdell, Rayleigh; Juan Amado, Bilbao; Andrew Burt, Ipswich; Ian Henderson, Mallow; Martin Carr, Kilmalee; Peter Kim, Lymington; A.J. Chisholm, Newcastle-upon-Tyne; Stephen Reid, Glasgow; Philip Wells, Middlesbrough; A. Ashton, Liphig; Ian E. McLure, Co. Down; Douglas Leitch, Carlisle; Paddy Humphreys, Southampton; Michael Wood, Ipswich; Rachel Mander, Stockport; Lee Bennett, West Bromwich; Andrew Johnson, Balfour; J. Kingsbury, Barry; Austin Brown, Liffordborough; Timothy J. Weaver, Reading; C. Hayward, Buxton; Paul Byrne, Mallingborough; J.W. Smith, Cornham; Stephen Smith, Ayr; M.J. Connell, Wexham; John Smith, Basingstoke; Peter Hadden, Weymouth; Moore, Basingstoke; Barry Hale, Peterborough.

Software auction

SOME OF THE TOP SOFTWARE HOUSES will be auctioning their software at the GJC County Hall on Saturday June 15th.

No, this isn't because they've failed to sell their wares through more conventional means. The auction is to be held in aid of the Ethiopian famine appeal. Software houses such as Argus, U.S. Gold, Pitman and Gibsoft hope their efforts will make this the biggest ever computer auction and boost the £250,000 already raised by Soft Aid.

Computer Trade Weekly are looking for any old and unwanted software to be included in the auction. Please send your pre-war copies of Space Invaders to:

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 Specialist Retail Price Ltd.
 Business Technology Centre
 Bosmer Drive
 Macclesage
 Here SG1 2JH.

Soft sales

Soft Aid, the brainchild of Rod Cousins, ex-managing director of Squelkline, has already sold over 50,000 copies and is still selling well. The Commodore and Spectrum versions have raised a total of £200,000, at the time of going to press, for the Ethiopian famine appeal fund.

Credit must go not only to Mr. Cousins but also to printing and software houses and distribution companies who have donated their time, skills and services free of charge, and also to retailers who have sold the games at little or no profit.



Stamp collection

Charitable souls also preside in the four Commodore offices—in fact, in the offices of all the magazines published by Argus Specialist Publications.

Being such hugely popular people, we receive stacks of fan mail, photos, letters, mislabeled shipping lists, etc., etc., every day. And, what is common to every envelope? Yes—a stamp. Well, instead of cluttering up the office bin with all these stamps we've been using them for a guide dog.

But, we're not quite as popular as we like to think we are. We need a total of over half a million stamps to sponsor the

dog.

Without any assistance, this is going to take us an incredibly long time. This is where you kind-hearted readers come in. Why prolong the loneliness of both dog and owner when your stamps can help speed up the process? If you receive a lot of mail, or even if you can spare stamps from your personal mail, please send them in to our ASP Guide Dog Appeal.

Please cut out the stamps, leaving approximately 1cm around each edge, put them in an envelope and send them to: Guide Dog Stamps, Four Commodore, P.O. 1 Golden Square, London W1R 3AE.

A likely tale



C-O-M-M-O-D-O-R-E 64

ORPHEUS
NEVER LOOK BACK

ONCE UPON A TIME, IN THE BOMBS of the Four Commodore offices, there sat a bored young journalist, searching for some light relief from the drudgery of pumping news into her flashy new word processor (wistful thinking—did it? This is a fairy story—bored young journalist, she sighed a bit). 'Twas not any old box, nay,' says Orpheus' new game, *Lidon*.

Thereupon, she loaded the game. The screen was painted with a beautiful creature—a heroine who flitted around the secret forest of Lidon, through hundreds of detailed forest glades, in search of the seven magical flowers of Nirvana. On her intrepid journey, in the face of many dark and sinister forces, she was accompanied by the ethereal music of Goring.

To renowned that a team of independent graphics designers, several freelance programmers and musicians cut aside their magic powers in favour of spending 5 months in the crypts of Orpheus, developing the game.

But, although fairies may lurk at the bottom of your garden, computer games don't grow on trees. £8.95 is the price to pay for this fantastic journey.

And, should you have trouble buying a ticket, Orpheus may be contacted at The Smithy, Unit 1, Church Farm, Holey St. George, Nr. Sandy, Beds. SG7 9JF.



Errata

In our review of Commercial Products' Numeric Keypads (June issue, 'Push Me, Pull Me', page 26), we borrowed the fact that this Numeric keypad does not have a RETURN key. But, a spokesman from Commercial Products kindly told us that our reviewer had no right to complain—the keypad does have a RETURN key. It is marked as an asterisk in the right-hand bottom corner of the original picture.



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Take to the skies with John
Farrar as he zooms on a
selection of Commodore
flight simulators.

MY FIRST ENCOUNTER WITH A computerised flight simulator was a *Pilot* program on a friend's Z801. Considering the limitations of the computer I thought it was amazingly realistic. From that moment the hunt was on for a comparable program. It's been a long wait but it's been worth it for now there is a veritable barrage of flight simulators on the market.

The flight simulators are as varied as the types of aircraft in the skies so I have divided them into groups – based on military aircraft, airliners and so on, if plenty of action is more to your taste, then opt for the military versions. Or, should you wish to feel responsible for 100 passengers then try flying a 737. The light aircraft versions, especially the Sublogic program, provide an excellent introduction to flight and navigation in general. So, let's strap ourselves in tight and take-off into the wide blue yonder.

Military aircraft

The McDonnell Douglas F-15 jet fighter is a high performance aircraft capable of speeds in excess of 3,000 mph and a ceiling of 65,000 feet. To match this performance, its weapon and defensive systems are equally impressive.



There are two programs available for this aircraft: one being *Fighter Pilot* from Digital Integration. This program provides a menu of options enabling the user to select landing practice, combat practice, combat, bad weather etc. All very useful and each good fun in their own right. The main combat task is to shoot down a

HIGH FLYERS!



bomber which is hell-bent on destroying your airfield. If you succeed another appears on the scene and so on. There is an on-board guidance system to help locate the enemy. This is backed up by a detailed map which shows your position relative to the enemy aircraft and your airfield. If you survive long enough, as the bombers shoot back, the fuel situation will become critical, creating the need to land – assuming there is an airfield still in tact of course. Brackets and a landing system are available but it is not easy. The displays are well done and excellent use is made of sound and graphics throughout the program. This program has had deserved success since its launch some months ago. For a fuller review see the April issue.

The other program based on the F-15 is *Strike Eagle* from US Gold. In *Fighter Pilot* the weapons are limited to cannons but in *Strike Eagle* the full weapon has been incorporated including head-on displays in the cockpit view. Bombs, cannons, rockets, decoy flares, electronic jamming – they are all here. You will need them, plus all your luck and skill, as there are 6 difficult missions to complete. The idea is that you destroy the primary targets on each mission but you will have to contend with enemy aircraft firing air-to-air missiles and SAM missiles also firing heat-seeking missiles.

Unlike *Fighter Pilot* there are no take-off or landing sequences. Assuming that you survive long enough, you are airborne throughout. To refuel and rearm it is only necessary to fly over your home base. Varying levels of difficulty can be selected, with the easiest, Arcade, providing a permanently horizontal horizon. The graphics and sound are excellent and the aircraft responds immediately to control movements. The excellent 36 page manual states that "The F-15 cockpit is a complex and stressful working environment". They are not kidding! I reviewed this program in detail in the May issue.

The final program in this category is *Spitfire 40* from Minisoft. There are just three scenarios to choose from: practice, combat practice and combat. You are a young Spitfire pilot in 1941, and must undergo thorough training before going into combat against the might of the Luftwaffe. So, once again, plenty of practice is required.



Three displays can be called up: the instrument panel, which is brilliantly done, the view from the cockpit window and finally a map of the south east of England. The scale of the latter can be altered, which is useful, as it is used to locate your airfield and the enemy aircraft. I was not too keen on having to toggle between the instrument and cockpit displays, as I found it broke the continuity of the program, particularly for landing approaches. However, if it was



necessary in order to provide such an excellent instrument display then I'll put up with it! I could have liked the aircraft shown on the map, to move, but the manual states that this is a means of providing a 'pause' in the program, which it does. Oh well...

The program aims to simulate the flying characteristics of the *Spitfire* and the epic dogfights of those 'Famous Five'. It easily achieves this with excellent use of the 64's graphics although the sound can get a bit monotonous on a long sortie. One good idea is the ability to time your flying time and 'talk'. I would like to see more use of this facility. The accumulation of hours and skill raises your rank through the R.A.F. 40 hours and the rank of Group Captain allows you to enter a Mirazant competition, to 'Tally Ho! chaps'.

Airliner

Flight Path 737 by Axiom has been around for some time now. The objective is to takeoff from the home airfield, fly over some mountains and land the other side. That's all there is to it! There are the usual levels of difficulty but the lowest is hard enough. The cockpit instruments are all of the digital type and are clear and concise.

From takeoff to the landing approach sequence, it is necessary to keep within the parameters for various controls. For example, the flaps cannot be raised below 300 feet and at less than 140 kts. The mountains are well drawn and the graphics and sound are adequate. I found lining up the aircraft with the runway at the start of each flight, a little tedious. My real gripe is with some awful spelling in one message 'ACCENT TO SLOW'. Talk! This is inexcusable. The cassette label claims that this is an 'Advanced flight trainer' which I think is going a bit far. Nevertheless, I found this program to be good fun and very addictive, which is, after all, what software should be.

Doctor Seth's **747 flight simulator** was written with the assistance of a British Airways captain, this program allows you the freedom of the north eastern European air routes. Starting initially from

Heathrow, you can select your destination and, assuming you have developed the necessary skills, you can route the skies to your heart's content using navigation beacons.

The keyboard controls are sensibly allocated (Beforules, F-flaps etc) and practice modes are available. When the joystick is moved left or right, the horizon tilts accordingly on the simple, 3D view through the window. Environmental conditions can be reset to alter cloud base and top, day or night flight, wind speed, and the starting point can be changed.

An added feature is a fantasy zone with weird shapes and effects located over the North Sea. The documentation fully detailed with the emphasis on navigation.



London (jet controls become the main concern to users of DANCE's **747 flight simulator**). The engine gauges also give the individual status of each engine with regard to speed, speed, gas temperature, pressure ratios and fuel flow. Flaps can be partially extended, ailerons and elevator positions are shown and a warning panel flashes signals to the pilot of impending trouble, emphasised by an audio signal.

One disconcerting feature of this program is that although the artificial horizon on the instrument panel indicates that the jet is banking, the view through the cockpit window remains resolutely horizontal.

Navigation is performed with the aid of a simple direction finder, leaving the pilot to worry about landing preparations.

The flight manual gives full instructions on the purpose of each gauge but a few words on flight principles would not go amiss.

Varied

The aircraft in this section are as different as chalk and cheese. One simulator is for a helicopter and the other for a glider.

The helicopter simulator is **Super Huey** from US Gold. I understand that it is

also available from Audiogenic (label a live £1 less than the £11.95 for Super Huey). Helicopters are a familiar sight in the skies over my home, in NW Cornwall, with hardly a month going by when we don't hear that another dramatic rescue has been carried out. The fastest Huey of a few years ago vividly springs to mind. Therefore, it was with eager anticipation that I loaded in Super Huey for the first time.

As with most of the flight simulators already mentioned, Super Huey is accompanied by a comprehensive flight manual. Once again, essential reading, as rotary-wing aircraft are a different kind of flying - altogether! You will learn terms like cyclic mode and collective mode, which relate to the control of the rotor blades and the tail rotor. A joystick is a must for this program, preferably with the fire button on the top, as it is used to toggle between modes. There is the customary practice session to help you 'get off the ground'. The on-board computer guides you through the stages of takeoff, flying and landing. At this point I have to say that the graphics and sound effects are stunning. The cockpit display is incredibly detailed and, as the helicopter gains height, surrounding buildings and radar aerials diminish in size. Pushing the stick forward provides forward momentum and soon trees and bushes are whizzing by the cabin screen. Climb to over 3000 feet and they disappear from sight. All the while, you are accompanied by the familiar sound of the engine and rotor blades. Great stuff!



This sets you up to tackle the other missions on the program. These are Rescue, Combat and Diplomacy. As they have to be loaded separately, it is necessary to record the tape counter readings in order to quickly locate each program. I have to say that, after the promise of the training flight, I found

Open your eyes to a wealth
of adventures with
Runecaster's guidance.

TWO MORE BOOKS FOR THE FRUSTRATED adventure games-player may just save the cold one or two of us from really going over the edge. They are *The Adventure's Companion* by Mike and Peter Gerrard and *The Commodore 64 Adventurer* by Bob Chappell.

They both follow an almost identical layout and each deal with just four well-known (and frustrating...) adventures. At the beginning of every section is a list of the 'problems' that you are likely to have found. This is followed by numbered references to each of these 'problems'.

Sections and cross references are laid out in such a manner as to not make it too easy to learn more than you need at any one time. This will hopefully not spoil your continued enjoyment of the game. However, you will have to be strong willed not to browse!

Both books have appendices at the back with complete maps of the listed adventures so again, no cheating!

The Adventure's Companion covers the Hobbit (Mellonware House), Caladrius Cave Adventure (Level Nine), Adventureland and Pirate Island (Adventure International).

The Commodore 64 Adventurer complements this with Heroes of Karn (Interceptor Micros), Lords of Time (Level Nine), Woodoo Cards and The Court (Adventure International).

Both are published by Gerald Duckworth and Co. at £1.95 each and should be available from any good supplier of computer titles. Some people bemoan the use of such books but you only have to look at the regular price for help published in the computer press to realise just how welcome they will be.

If you are in dire need of a handy shoulder to cry upon then, short of contacting me, remember the *Adventure's Guild of Grasmere, Kern* - not only will they tell you all the latest and best adventure games but they themselves are total enthusiasts. Their live line, *Adventureline*, is open to all. Write the number down now: 0475 524055.

Loading problems?

Adventures are often very large programs and now that there are a number of 'fast loaders' available for the Commodore 64, we have got rid of the frustration of fifteen minute loading times. Sadly this has introduced another possible area of concern - the C20 cassette recorder!

Fast loaders stretch the capabilities of



your system to the limit. This means that not only should the heads be clean but also that they should be accurately aligned to accept all of those high speed signals. Many of the tapes sent back as not working are perfectly alright when it is the cassette recorder that is not up to scratch. Although there is always the risk of aggravating the situation, at some stage you have got to consider re-aligning the recorder's heads. This can be done by trial and error but the adjustment is quite critical and this method is not to be recommended!

Arishnu Head Alignment Tape

RECOMMENDED FOR THE COMMODORE 64 CASSSETTE DECK



Recently, Interceptor Micros have produced an 'Arishnu Head Alignment Tape', priced £7.95, that should take the uncertainty out of the operation. The kit consists of the alignment tape, a screwdriver, a trade but effective card pointer and pretty comprehensive instructions.

If your heads (1) are out of alignment, this may be because (1) they have never been correctly aligned or, (2) the heads have moved out of alignment. The aligning screen is usually sealed in position with a dab of paint. In case (2), this may have cracked and the screen turned slightly, due to the vibration caused by the cassette motor.

Run the tape and follow the instructions but whatever you do, before you move anything, take a careful note of the present setting! The single card printer that is supplied may be taped or stuck to the screwdriver... use it. Do not be tempted to 'have a twiddle to see what happens', you could spend the next hour trying to find where you started from!

The adjustment for fast loaders is quite critical and you will probably find that only a small amount of movement will sweep you right through the working area.

The tape consists of the working program recorded at normal speed, followed by data that the program needs - recorded at high speed. Once 'swapped in' on this high speed data, a number is incremented, showing a count from 1 -

adventure games. Not shown by name, but the hint of a flowing black cloth coupled with the odd note lying around, have all us adventures looking over our shoulders and checking the condition of our necks!

Two more adventures for the CBM 64 using the now familiar theme have recently been added to those on offer. The first of these is from Melbourne House (still trying to find a successor to The Hobbit), it's called **Castle of Fear**; the second is from Duckworth (still trying...) with **Castle Dracula**.

These two, although having the same basic theme, are two very different games. That from Melbourne House gives the impression of the more polished programs, with excellent music and good graphics (a different one for each scene),

and acceptable 15 for **GRAPHICS** is nice but **DRACULADOC** is not understood, you must use the full word **DRACULADOC**! This sort of input is often mistaken but is frustrating to start with.

Castle of Fear is rather reminiscent of some of the Scott Adams games, with several delicious puns and the feeling of puzzles within puzzles. It isn't a game I would recommend to the novice but certainly one for the dedicated puzzle solvers with time on their hands. Loading time is less than four and a half minutes (even if the instructions say less than three!). Before typing **QUIT**, it means just that - once invoked there is no turning back - try **RUN** instead.

Most surprisingly, you may **SAVE GAME** recording your present position in the game, to return to later (**SAVE** by itself gets



8000. Move on to the setting and the count is entered and starts again as you come back on tape.

The system is crude but effective, providing you are not far off where you start. As was said above, make sure you know where you started from! Itaving got the correct alignment, re-set the adjustment screw, either with a drop of nail varnish (renewer paraffin and re-set the original point) or a drop of glue (probably cellulose). Whichever you use, can try drop on the end of a cocktail stick (or similar) is quite sufficient... do not get any in the works!

Out for the Count...

Count Dracula seems to have fascinated all those that have heard of him ever since his debut first put his name to paper. One of the all time classics is Scott Adams' **The Count** and he has turned up in numerous other scenarios, featured as

While that from Duckworth has no graphics or music.

Castle of Terror has the more convoluted, devious plot with many pitfalls for even the seasoned adventures. Buy the 'old man' a drink before the correct time and not only have you spent your hard earned coin, which you apparently cannot replace but you have also missed your opportunity to get the clue he might otherwise have given you!

The music is really something for the first ten minutes, after that you may be forgiven if you turn the sound down. The graphics are good, with a few animated sprites chosen in for good measure. There is no way to turn the graphics off to speed up the response time but the scenes are shown quickly, leaving a six line window below them, within which are all text responses. Sometimes more than six lines of text are scrolled through fairly quickly so you have to keep your eyes peeled.

Complex sentences are recognized but only a few shortened forms of words

a 'don't understand' message. This rather important function is not mentioned in the instructions and only becomes apparent when inspecting the vocabulary with the **VOCAB** command.

Castle Dracula by Duckworth has no graphics or music but, as regular readers will be aware, I have always felt that, unless these materials add to the game, I would rather have the speed of response and let my imagination loose on longer descriptions.

A fast loader is employed and loading time is about four and a quarter minutes. Response time to input commands is fast and text is scrolled until the next location description is called for. Colours are used very sensibly and the display is easy to read.

Location descriptions are not very long but there are about 100 of them to be prepared for fairly long sessions! There are a number of humorous responses that add to the fun.

Only the first three letters of the input

commands are scanned to the impatient are well catered for. Complex sentences are not understood, which at least means you know exactly where you stand, as a simple **WALK NORTH** entry is less likely to be misinterpreted. Movement is only in the cardinal directions and single key entry is accepted.

Instructions are minimal - just those on the back of the box, so although you know your purpose (kill the Count, anything extra you must sort out for yourself. You may **SAY GAMES** pretty quickly too ... to continue later - you'll need to!

General impressions are that *Castle Dracula* is a well planned game in a fairly classic style, a little thin on the description for a true only game and rather an out of date command

Superset for the M4/1 PIT - that was a M4 crackpot!

This game has versions for the CBN/64 and the VIC-20 (one on each side). ... so at last we can remember the other major Commodore machine in terms of Adventure! (being looking you Plus 4 and C-64 users, we may yet have something for you)

The Quest is text only and the choice of colours is not so well thought out as *Castle Dracula* above. Some text is light red on light blue is not guaranteed to achieve good results on anything but a monitor but it is still readable.

The display layout obviously has wrong feelings to the size of the VIC screen with some words joined together where previously they were the last and last words on consecutive VIC lines!

dark AND A KEY? Try to OPEN ALL and be told "You haven't got a key".

It has a few slightly more annoying faults such as clearing the screen before answering your commands - this means you have to LOOK if you have forgotten the middle exits it is quicker to type **GO ...** and it has no **SAY GAMES** facility, in fact it appears to have no GUESS either - definitely a case of "do or die".

It is really a little unfair to go on, isn't it? for all its shortcomings. The Quest of Meraval is the last of adventure one could well not own a text on let's face it, one should not be attacking the plant, except when it is there anyway.

Ignore the anomalies and the game will teach the new owner some of the art of adventure gaming. Adventure games are becoming more and more involved so there is always a place for the more basic training ground.

Another oldie

Yellow's Ark is another game from yesterday (some years ago) on the Spectrum, based loosely on a Dungeons and Dragons type of game. It has been released for the CBN/64 by Atlantis Software - at the remarkable price, for an adventure game, of £2.95.

It is text only and again from the normal puzzles, riddles and general misrepresentation that one expects from an adventure game - *Yellow's Ark* offers the player choice of character type and a variable, if rather random, combat routine.

As this game is produced down to a low price, it does not have a fast loader, so you must wait about fifteen minutes for it to load - just time to make a cup of coffee and put out the cat. You must first choose your character class.

You have three choices: Warrior, Wizard or Priest. This determines how your character will tackle the routines met along the way - it is not possible to avoid them entirely.

Response is fairly fast and certain abbreviations are accepted but it is not always easy to determine them beforehand to a certain amount of care must be exercised in this direction.

There is a **SAY GAMES** facility which you may well need! Sadly, I could not find a GUESS routine ... at one point this was a little frustrating as I got myself locked in a room without the key; the only way out was to switch off and re-load the game.

I expected something like that to happen when I moved that darn rule! but I didn't think the outcome would be quite so final (you can't all be perfect all of the time!)

At this sort of price it has got to be good value - you certainly will not regret it as an evening. Once having done so you may well want to try again at a different character type.



improver that cannot even decipher THE GUESS BALL - is not understood, you must revert to GET BALL, it is a good game to play but I doubt if it will have the holding power of some other games on the market.

The worst yet!

I recently got a copy of a game that has been out for some time - *The Quest of Meraval* (Atlantis Gaming). It must rate as one of the worst I've come across. BUT it is for a strange fascination ... it is not an expensive game and has the makings of a good beginner's adventure.

The Quest was written before the days of fast loaders and takes just over seven minutes to load. I believe it was first produced for the VIC-20 (plus the M4 extension pack) and so some of the limitations imposed by memory considerations must be taken into consideration ... mind you, does anyone remember "Cracks of Doom" by



The new accepted single key movement commands are not recognised. The format **GO N** or **GO NORTH** must be used to travel around. Also, surprisingly, you have to enter the complete word for it to be accepted ... **BLU, BLUCK, BLUCK** will not be understood but **BLUETT** will.

It shows a roughly habit of answering a command concerning an object that is not at that location ... by typing **GET PLANT** anywhere and you get "It won't come out of the ground".

There are some classic anomalies ... you die from thirst and hang around drinking - all the people "die" away ... press **ENTER** and miraculously all is as it was - the original location message appears and the game is busy again.

There are other features too ... **KICK THE PLANT** and find that "It's unappetising at the noon", try to **GET PLANT** and "It won't come out of the ground". There is also the beauty where "You are in a dangerous, you can see nothing ... it is too

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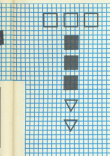
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READ HCW FIRST!



The first command sets up a definable character set at a specified address. This address can be any of the permitted locations allowing the use of any of the banks. Figure 2 shows how to set up a character set at \$C000. Lines 10 and 20 change the bank and line 30 shows the screen to \$C400.

```
10 PORT $A5%MIN:$A5%B:OR0
20 PORT $A5%,PIER($A5%AND $27-$D8)
30 PORT $48,196
40 SET $H:$L:$A5%AND $7:$58
```

The remaining commands alter the specified character, with the second command redefining any character and the eight parameters specifying each of the eight lines of the character.

The functions of the next four commands are self-explanatory. Listing 2 shows how a number of effects can be achieved by the selective scrolling of specified characters. The behaviour of multicolour characters when scrolled is particularly interesting.

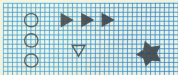
The invert and 'back-to-forward' commands are handy because they let you use a single design for several characters. This is very useful if, for example, you want to have a figure moving back and forth across the screen.

Next month I want to tackle a slightly more obscure area. Most arcade games use colourful effects to portray explosions or blend from one screen to another. I will give some simple routines which can be used to give some interesting effects to your games.

Program Listing 2

```
10 SET
20 SET $D00:1:FULL:4000:1000
30 SET
40 ($FFFF-$FFFF)/1600
50 PORT $D00:0:PORT000:($FFFF-$FFFF)/1600
60 PORT $D000:0:PORT000
70 PORT $D000:0:PORT000:PORT000:PORT000:PORT000:PORT000:PORT000:PORT000
80 PORT $D000:0:PORT000:PORT000
90 PORT $D000:0:PORT000:PORT000
100 PORT $D000:0:PORT000:PORT000
110 PORT $D000:0:PORT000:PORT000
120 PORT $D000:0:PORT000:PORT000
130 PORT $D000:0:PORT000:PORT000
140 PORT $D000:0:PORT000:PORT000
150 PORT $D000:0:PORT000:PORT000
160 PORT $D000:0:PORT000:PORT000
170 PORT $D000:0:PORT000:PORT000
180 PORT $D000:0:PORT000:PORT000
190 PORT $D000:0:PORT000:PORT000
200 PORT $D000:0:PORT000:PORT000
210 PORT $D000:0:PORT000:PORT000
220 PORT $D000:0:PORT000:PORT000
230 PORT $D000:0:PORT000:PORT000
240 PORT $D000:0:PORT000:PORT000
250 PORT $D000:0:PORT000:PORT000
260 PORT $D000:0:PORT000:PORT000
270 PORT $D000:0:PORT000:PORT000
280 PORT $D000:0:PORT000:PORT000
290 PORT $D000:0:PORT000:PORT000
300 PORT $D000:0:PORT000:PORT000
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540 PORT $D000:0:PORT000:PORT000
550 PORT $D000:0:PORT000:PORT000
560 PORT $D000:0:PORT000:PORT000
570 PORT $D000:0:PORT000:PORT000
580 PORT $D000:0:PORT000:PORT000
590 PORT $D000:0:PORT000:PORT000
600 PORT $D000:0:PORT000:PORT000
```

END





OUT OF THE MARCHES THIS MONTH comes a letter from Chris Rogers of Ryle, Mo. written to me about Kalamazoo's Ghostbusters, saying, "My two personal \$4,000 are in (179-80) and are 1000/100 (179/80). I want to try and reach the \$100,000 mark on Ghostbusters - if the program will accept such a score!" Well, Chris, when I spoke to David Green at the 177 '80 show, he said he had an account number to get \$999,990. Whether this was the highest you can get, I don't know, but I'll find out! By the way, David wouldn't tell me what the account number was. Blast!

By the way, David, Choplin's producer, Rain on William's Bay by about a year and a bit, and Lode Runner is nothing to do with it either.

02/01/2011

while a thousand tiny lights moved from the lower Curlew countries over to my side. The silence and the response made me mouth an *Oh*.

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Peace the world

A.P. and D.J.

Stephenson explore
the mathematical
capabilities of
programming in
BASIC.

T · H · E



PART 10

F · A · C · T · S

THE BASIC LANGUAGE TAMED mathematics. Highly complex equations can be programmed with ease and tested with real figures without the customary arithmetic discrepancy. The mathematical commands on the Commodore machines are powerful and capable of handling complex equations but it is easy to fall into traps caused by such gems as division-by-zero, serial mode and unrounded rounding errors.

Translating text book equations

A text book equation can rarely be directly implemented in BASIC. For example, $5x^2$ written in BASIC must be written as $5*(X^2)$ because there is no provision in BASIC for positioning a variable 'up in the air'. Multiplication is indicated by '*': the equation $5x+4$ must be changed to $5*(X)+4$ else the computer will think that $4x$ is the same as a single variable and an awkward bug will be created.

Equations within functions must be enclosed in brackets, even though they may be optional in the text book version. For example, a mathematician would write $\cos X$ or $\sin X$ but we must translate these to $COS(X)$ and $SIN(X)$. In BASIC, a function is a special keyword, characterized by the enclosure of brackets around the variable. It is used to supply the language with a few of the commonly used mathematical operations, other than addition,

subtraction, multiplication and division such as $COS(X)$, $TAN(X)$, $ASN(X)$, etc.

Degrees and radians

The circumference of a circle is divided into 360 parts. However, BASIC trigonometrical functions expect angles to be measured in radians. Thus, $SIN(45)$ is asking for the sine of 45 radians. If you prefer to work in degrees, you can use the π key for converting radians into degrees. For example:

The trig functions $SIN(X^\circ \pi/180)$, $COS(X^\circ \pi/180)$ and $TAN(X^\circ \pi/180)$ will work if X is entered in degrees.

Logarithmic functions

Some BASIC dialects offer two log functions, one to base 10 (common logs) and the other to base e (natural or natural logs). But Commodore 64 BASIC only offers the latter.

LOG(X) returns the log to base e . The number can only be expressed exactly, however many digits are used, but 2.71828 is accurate to 5 digits. It is a strange number which can be calculated to any order of accuracy by use of the series:

$$e = 1 + 1/1! + 1/2! + 1/3! + 1/4! + \dots$$

The more places you take in the calculation, the nearer you will get to the true value, but don't go too far. If you calculate the

series to, say, 20 terms the number of digits would soon exceed the calculating precision of the machine and any further additions would be meaningless numbers.

The exponential function

EXP(X) returns a value, e^x where e is again 2.71828 etc. The function crops up in such areas as radio active decay, swinging pendulums and population statistics. This is also an important member of a group known as hyperbolic functions.

Inverse trig functions

ASN(X) is the only inverse trig function directly available since it is the one most commonly needed in practice. But, the range can be extended by using some standard conversion formulas. We have arranged the formulas as defined functions so they can be entered directly:

```
DEF FNASC(X)=ATN(X)/SQR  
(-X^2+1) (for values of X less  
than 1)  
DEF FNAC(P)=ATN(SIN(P)/  
(-X^2+1)^.5) (for values of X  
less than 1)
```

We have named the functions AS and AC respectively.

Hyperbolic functions

Normal trig functions are based on the circle. Hyperbolic functions are similar but are

based on the curves known as hyperbolas.

They are not directly available but can be obtained from standard conversion formulas. They are set out below in defined function form and are true for all values of X:

```
Hyperbolic sine:  
DEF FNHS(X)=(EXP(X)-EXP  
(-X))/2
```

```
Hyperbolic cosine:  
DEF FNCH(X)=(EXP(X)+(EXP  
(-X))/2
```

```
Hyperbolic tangent:  
DEF FNHT(X)=(EXP(X)-EXP  
(-X))/X+1
```

We have named the functions HS, CH and TH respectively.

Use of brackets

When writing down algebraic expressions, we can rely on operator precedence, as the following:

- raising to powers
- negative quantity
- multiply
- / divide
- + addition
- subtraction

Examples:

```
5+3*7=16  
5*(7+3)=40  
5-18/7=2
```

However, to avoid errors, it is safer to use brackets liberally than to rely too heavily on operator precedence.

Subroutines or defined functions?

In general, the defined function is simpler and more economical than writing equations in the form of separate subroutines. In fact, the defined function is tailor-made for the job, allowing local protection for parameter variables. One reminder – the function must be defined with 100 Hz before it is called with 50, hence the definition need only be executed once, however many times it is called, it is best treated as an initialization task and placed near the top of the program.

Handling simple equations

The majority of equations in technical books present little difficulty. As a simple example, we shall take a well-known equation from the field of electronics to illustrate some of the pitfalls. The formula, as it would appear in text books, gives the frequency of a series resonant electrical circuit (if you haven't a clue what this is, do not fret – it serves merely as an example):

$$f = \frac{1}{2\pi\sqrt{LC}}$$

Any equation, not just this one, should be examined to see if there are certain values of the variable which could cause a crash. We begin by re-writing it in a form acceptable to BASIC:

```
RR=1/(2*PI*SQRT(L*C))
```

This will work OK, but, if the equation is to be set into a loop which repeats many times, the term in the denominator, $2\pi\sqrt{LC}$, is best performed before the loop is entered. If we write, say, $C=2\pi\sqrt{LC}$ somewhere, the equation can now be written:

```
RR=1/(C*SQRT(L*C))
```

We may then decide to put it into defined function form:

```
DEF FNRL(L,C)=1/(C*SQRT(L*C))
```

The name of the function is **Rl** and the formal parameters are **L** and **C**. Later, we might call the function with, say:

```
RR=FNRL(1,1.1)
```

where 1.1 and 1.2 are the actual parameters. We could also pass over direct constants:

```
RR=FNRL(1,2,1.2,1.3)
```

If **RR** was printed to 4 decimal places, we should get 2.00740.

Watch out for the following:

L or **C** or both can be zero in the denominator because the square root of zero is a real number but the machine would still output the error message "DIVISION BY ZERO" because 1/zero is infinity.

If one of them is negative, the result is unreal and would trigger the message "NEGATIVE QUANTITY".

But, if both are negative and run into, the product of **L** and **C** remains real and acceptable by the machine.

Scaling problems

The M1 system (System International) has been used in technical colleges and universities for many years. Whatever system is used, there will always be some units which are too large or too small for practical measurement. Electronics abound with staggeringly large and small units. For example, the M1 unit called the farad is so generous that the total capacitance of the planet earth, treated as a perfect conducting sphere, is only one-quarter of a farad! In practical electronics, even the microlfarad (one millionth of a farad) is a relatively large unit and capacitances of a few picofarads (one million millionth of a farad) are not at all unusual.

Values like these present difficulties when trying to write your internal programs. For example, it would be most practical to input the value of capacitance in terms of microfarads than in farads. But, you can get into a right old mess by re-writing equations using multiples or sub-multiples of the unit. The safest way is to convert all values received from user-friendly keyboard input immediately into standard M1 units, leaving them in this form until all calculations are finished. For example, our previous formula

for series resonant frequency is only true, as it stands, if **L** is in Henries (H) unit of inductance and **C** is in farads. A suitable request for keyboard input might be:

```
100 INPUT "ENTER INDUCTANCE IN MILLIHENRIES ";L1
110 INPUT "ENTER CAPACITANCE IN MICROFARADS ";C1
120 L=L1/1000
```

Line 120 converts millihenries to Henries and microfarads to Farads, ready for direct implementation into the standard equation. Although we have recommended that units should remain in pure M1 form throughout the length of the program, when the time comes to print out results, the units can be converted back again to more practical values. Thus, if the result of our equation for **f** was 40000 Hz, we might like to print out in the kHz (1000 Hz) so we could write:

```
500 FNRL/1000
510 PRINT "SERIES RESONANT FREQUENCY IS ";R;" KHZ"
```

If you follow these guidelines, you reduce the chance of a calculation being a million, or hundred of millions, out.

Quadratic equations

Many readers might be familiar with the following solution for the two given roots:

If $ax^2 + bx + c = 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The presence of the square root in the equation implies that some values of the coefficients **a**, **b** and **c** can yield unreal solutions because mathematicians have decreed that the square root of a negative number cannot exist. The condition for general solutions is when b^2 is greater than $4ac$. The expression within the square root is often known as the discriminant because it 'discriminates' between real and unreal solutions. When writing equations which involve the solution of quadratics, it is wise to evaluate the discriminant part of the equation immediately because,

if the result is negative, there is little point in proceeding further.

But, unreal roots do occupy an important position in the theory of alternating currents in general and the behaviour of oscillatory circuits in particular. The 90 degree operator allows the two unreal solutions of a quadratic to be expressed in the form:

R_1 and R_2 ;

Any quantities prefixed by **j** are the unreal parts of the solution. Solutions which contain a combination of real and unreal terms are known as complex solutions. In order to get the computer to accept complex solutions, you must test the discriminant *in* before (but, instead of rejection, convert it to the absolute value using the command ABS). In other words, change it to positive which is equivalent to reversing the terms within the discriminant. To compensate for this trickery, the operator **j** must serve as a label indicating that such a trickery has been carried out. The equation needs to be slightly re-arranged so that the real and unreal terms are separated:

$$\begin{aligned} \text{Solution 1:} \\ \frac{-b + \sqrt{\text{discriminant}}}{2a} \\ \text{Solution 2:} \\ \frac{-b + j\sqrt{\text{discriminant}}}{2a} \end{aligned}$$

The character **j** is just a string character which can appear only in the final printout of the solutions. It can take no part in computer calculations.

Polar and cartesian coordinates

A point in two-dimensional space can be expressed in terms of polar coordinates or cartesian coordinates. Instructions to draw 10 miles on a bearing of 45 degrees, are in terms of polar coordinates. Instructions to walk along a certain street for 100 yards, then take the first street on the right and walk a further 50 yards are given in terms of cartesian coordinates. A moment's reflection on these definitions should convince you that polar coordinates are

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COMP

Get on board for our high-flying July competition.

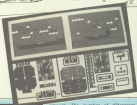
HA, HA, HA, HA, HA-HA, HA, HA... NO, your man ain't deceiving you, these are the first few notes of the national flying tune of all time - the Dambusters Theme Music - a very noble lead-in to jump jet. Armstrong's follow-up to their ultra-successful, Night Path PIC.

Jump (or let the Commodore do it) for release at the end of May, it will retail for \$29.95 on cassette and \$39.95 on disc. Fully lucky prize-winners will be able to stimulate mayhem in the living room if they're tired out of the bug with the correct answers to our competition. And, even luckier than that, by getting a winner will not only win a copy of Jump (or let) but will be able to contribute to their heart's content with a copy of Amiga's Super Match (valued at \$49.95 - see last month's issue for our site review). Above all have to become such a lucky person, better say:

Jump jet is a jetpack and flight simulator, written by Vaughan Dowling, for many years, was a jump jet game. It starts by taking you all at once as you take off from the landing deck of a carrier. Using a variety of instruments on your dash board and your radar screen, you can locate the enemy aircraft. Then it's decision time - should you throw caution to the wind and pursue the enemy or make yourself a laughing stock by returning to the carrier with your tail between your legs. But, even if you successfully attack and destroy the enemy, there is only enough fuel time on board so you must return to base after each mission.

This is jump lot in a nutshell. The skill levels reflect the ranks in the RAF - Flight Lieutenant, Squadron Leader, Wing Commander, Group Captain. One definite plus is the use of sound to relay messages - for example, 'Ready for take-off' means contact or 'Low fuel' - essentially hands for those who can't read.

For those who missed out on last month's issue (hard copies available from this office) — ed. I Super Search is a clipping folder accompanied by some modified software and, in our reviewers' opinions, is "excellent value and great fun". It retails for \$49.95 (no discounts) and \$34.95 on disc.



How to enter

Study the pics of our very own Air-Commodore (for the uninitiated among you, that's the rank above group captain in the air force). Now, even if you are not bright enough to realize that the word Commodore refers to anything other than a computer or a (long) British class, you can't fail to notice that there are several differences between our new pictures. But how many? I'll tell you, first circle the differences on the picture and the next morning, and on chosen the

amount. The number of differences should also be written on the back of the envelope in which you send your entry otherwise we will not be able to score it.

You may enter as many times as you wish but each entry must be on an official coupon and sealed in a separate envelope. Please write clearly on the coupon as it will be used as a label if you win a prize.

Fill in your answers, name and address on the entry coupon and send it to Amigo Competition, First Commodore, 1 Golden Square, London W1R 9AB. The closing date for the competition is 31st July.

PETITION



The Rules

Entries will not be accepted from employees of Argus Specialist Publications Ltd, their printers and distributors, and Atari Software. The restriction also applies to employees' families and agents of the companies.

No correspondence will be entered into with regard to the competition results and it is a condition of entry that the editor's decision is final.

The How to Enter section forms part of the rules.



Atari Competition

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I spotted differences.

Remember to write your answer on the back of the envelope or your entry will be invalid.

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INPUT

Agony uncle, John Donovan,
solves more problems and
heartaches.

INPUT

I am having great difficulty in obtaining a printer for my Commodore system. I already have the 4387 tractor printer but wish to obtain a printer of 'letter-quality' output. It would also be nice if it could take both continuous and separate sheet stationery. The present system comprises a Commodore 8032 micro, 8000 dual disc drive and 4002 Tractor printer (not matrix).

I would be grateful if you could advise me on the type of printer to use (other than Commodore) and any interfacing required.
A. E. Moyce
Sourhampton

OUTPUT

I suggest you use a printer interface such as the Panda variety marketed by Fast International. This does, if you really want letter-quality you will need a daisy wheel or printer, but these are expensive. You could try either the Star 9C-15 or the 9C-16. Also, take a peek at our Business Review.

INPUT

I bought my 44 in July, just the time during my retirement and I now have a collection of software on cassette. I am also attending evening classes in BASIC programming. I have recently acquired a 1541 disc drive and would like to transfer all my software onto disc to obviate the delay in loading the programs.

Can you recommend any commercial software which would enable me to do this?

Some time ago, I plugged in a games cartridge whilst the 44 was switched on. The cartridge is now corrupt and unusable. It is also possible to have a backup copy of a cartridge program transferred onto disc so I don't make such an expensive mistake again? Can the cartridge be re-programmed?

B. Mancaster
Bath/High

OUTPUT

Yes, it is possible to transfer software from cassette to disc but, unfortunately, some naughty people use this process for piracy and, therefore, I cannot disclose any details. The transference of cartridge software is also possible but, for the same reasons, I cannot give you any further information.

INPUT

How do I save-to-disk a program which I'll save along with each part of the program (having the same line numbers and with the last line of the previous part loading the next part). I have tried several ways of doing this such as using 10 different tracks but nothing seems to work.

John B. Tomlinson
London

OUTPUT

Change each load statement to LOAD "xxx",0 (ie, LOAD "Part 2" at the end of Part 1) and... hey presto, your program is answered!

INPUT

I have a Commodore 64 and wish to copy in programs. Unfortunately, a list of programs have single 4032,605 statements on a line and I find that my computer keeps throwing up the syntax error RETURN WITHOUT GOTO/IF.

Can you please tell me how to correct these programs.
R. Hills
Folkestone

OUTPUT

There is some confusion here. There is no error in placing a single RETURN on a line. The error message means that a line containing a GOTO/IF has been omitted earlier on.

INPUT

In response to Mark Jones' letter (Input/Output, May = 'sluggish 1987'), anyone using a 1540 disc drive can now load most software from discs faster using Trips'n's CTF (LOADIN CARTRIDGE). It costs £26.00 inc. p&h and features advanced load and save commands, the ability to display the disc drive directory on the screen without erasing programs in memory, an on/off switch so there's no need to copy it in case of a conflict and a reset switch.

G. Kelly
Tipton

OUTPUT

Anyone who agrees that the 1541 induces confusion may contact Trips'n at 761-763 Kestrel Street, Colindale, South Humberide, DN10 1PD.

INPUT

I have been asked by a friend to take a Commodore disc drive and software back with me to New Zealand. I am concerned that British hardware and software may not work with Commodore machines over there. Although the power supply is the same, I know that TVs use different frequencies and so British computers cannot be hooked up to a New Zealand television set as a monitor. Can you tell me whether the same is true of disc drives and software.
Lyall Evans
London

OUTPUT

If the power supplies are the same then you are OK with the disc drive. As far as software is concerned, most of our comes from the States, so there should be no problem.

INPUT

In your January issue, you answered a query from Jim Hunt in Portsmouth, about a PET. You replied that you cannot get auto-repeat on all of the keys. You can. There are 2 machine code routines for BASIC: 1 and 2 (BASIC) it has a repeat key published in Kevin West's book 'Programming the PET/CBM' (page 258).

By the way, apart from the information you gave in your reply, ROM 207.0 is a good way of disabling or turning off the keyboard within a program on any 4key (single) filling the keyboard buffer with 'garbage' while processing rates plots.

Tom Ryan
Manchester

OUTPUT

Well, I suggest that all readers with similar problems set their 'Belly Finger' loose over Mr. West's Book - it's a good 'test'!

OUTPUT



Our reviewers pass

Judgement on the latest

software gems found lurking

on the editor's desk.

Rock'n'bolt

★★★★

Action/Adventure

[15.99 cassette]/[19.99 disc]

CBM 64 — joystick essential

AT LAST — AN ORIGINAL GAME WHICH requires you to use your brain, and not just your trigger-fingers. The task is to bait goblins together for each of 100 floors of a new skyscraper. They do not form a

simple grid, but each floor has a complicated layout filling up to three screens. The goblins move around as if swinging from the jib of a crane, and you need to jump about, then bait them down in the correct positions. At this point you find yourself cut off (in your grime) so you need to create several bolts, and think again! The goblins have to be lassoed in the right order to get back to the lift and the next floor, and while this alone is quite an exercise in logic, there are two options where you are set against the clock, and these are really challenging! You are paid for the number of bolts successfully lassoed, and your score is the total pay.

The game has excellent 3D graphics with very smooth animation, and is accompanied by a good rock soundtrack.

If you like slaughtering everything in sight this game is not for you. If, however, you are intrigued by the idea of a sort of computerised Minesweeper, then it is quite exceptional and not to be missed!

FRB

software spotlight

Grand Larceny

★★★★

Mystery/Horror

CBM 64

CBM 64 (joystick optional)

DAMNED CLIVE, THESE MILLIONAIRE HOUSE CHAPPERS. Just as the Hobbit begins to become a fading memory, blow me, they come out with yet another, excellent adventure game which sets the pace for others to follow.

Grand Larceny is set on the layout of a hotel (the Grand) the object being, first of all, to get into the place and secondly, to get out again having recovered stolen plans before your time runs out. The screen is divided in three: the top part shows the adventurer and his immediate surroundings, the middle screen

contains a textual description of the location and describes any special objects to be found, and a command entry window occupies the bottom part of the screen. Your hero walks at variable speed with joystick or keyboard assistance while the locations scroll from left to right across the screen in the graphics window. Help vines open up as doors are opened, stairs are ascended and so on. Detailed descriptions can be called up at any time with the LOOK command and all the exploration is accompanied by a repertoire of well produced scary music.

Verbal commands are listed in the cassette inlay and while this removes a lot of the fun of finding the right thing to say this is more than made up for by the variety of movement options and the limited interaction with the other characters in the hotel.

Speeded adventurers might find the game less of a



challenge than they are used to since a good deal of the memory is occupied by the graphics but as a game that offers something a bit different coupled with its own sense of humour it still presents a good package.

The only minor criticism is that there does not appear to be a save option, but since you are presented with a fairly tight time limit within which to accomplish your mission, this is more of a niggle than a nuisance.

RM

Tycoon Tex

★★★★
Gremlin Graphics
16:10
C64 or Plus/1



TYCOON TEX, WE ARE TOLD, IS A routine tootin' oil tycoon who, surprisingly, spends his time not with tea-dinner but running along his pipeline and jumping over breaks in it! Somewhere or other this adds a few more millions to his bank balance. He is under frequent attack, but he can shoot back, and gain valuable bonuses from destroying barrels, helicopters and other hazards. At the end of each section of pipe, points are awarded depending on the speed at which it was completed. Another section then begins, with a different setting and new enemies.

This game owes a good deal to Moon Buggy but it is quite brilliantly programmed, with first-rate scrolling graphics. There are 99 levels in all, with hazards which vary in difficulty from level to level. The title screen gives a high-score table and various options including a demo mode - the whole effect is very professional and impressive.

This is the first game of its type for the C64/Plus-4, and I recommend it highly. By its nature there is not a great deal of variety, but it is a real test of concentration and speed of reaction. So get out your joystick and follow that pipeline!

P68



Pole Position

★★★★★
128 Gold
16:10
Commodore 64 + joystick

BUT AS THE WELL-KNOWN formula One Grand Prix circuit hits the road again with its globe-trotting action, so the runaway success of the arcade hits for the past year or so turns on to the screen. And if you're thinking of running with the pack or even starting in Pole Position, then I'll guarantee that you've made the right choice.

This is a great motor racing game and a superb piece of artifice. There are three races you can enter, each with a different difficulty level and, of course, a practice run so you can build up your skill. Before you can race you have to go on a qualifying run and claim one of the eight positions on the starting grid. Beat the 73

second time limit and you make the grade to run with the elite! Beat 58 seconds and you start from the front of the grid, in pole position. Racing is restricted with extremely clear graphics of both cars and the track. All the car's control functions are operated through the joystick: left and right to steer, forward to accelerate, the fire button to change gear and back to slow down.

Other drivers in the race are both an obstacle and a chance to score points when passed. Off track sign posts can also wreck the car although you do have an unlimited supply of cars to call on within the allotted time. Driving off the track will slow you down considerably and lose you time as will taking the corners too fast as it causes the car to skid. Keep up the race runs and prepare to take the checkered flag. Pole Position is a real winner.

K64



Petals of Doom

★★★★
Gremlin Graphics
16:10
C64 or Plus/1

GARDEN PESTS ARE A menace, and the varieties found in outer space are the worst kind! Your task is to hunt down and destroy all sorts of alien bugs in 99 plantations of space-flowers. By enabling the five plants in each garden to reach maturity, you may proceed to the next level. There are many kinds of alien insects, each of which moves in a different pattern, and some

pose a worse threat than others. On the higher levels the procedure is repeated, but with more bugs to kill. The pests are destroyed by you firing at them, while things above ground with the aid of a power supply in your back pack. Once your batteries run low you are helpless until they are recharged. You may choose to have up to six lives.

As with other games from Gremlin, the graphics are superb and the use of sound is also good. The game suffers, however, from lack of variety and, although it is fun to play, I suspect that I would tire of it quite quickly. Otherwise it might have merited a fourth star.

P68

Softaid

Band Aid Trail
\$4.95
CBM 64 (joystick)

THERE CAN BE FEW PEOPLE UNWARE of the success Band Aid has had in raising money for the people of Ethiopia. Indeed is the computer industry's answer to Bob Geldof, and is a collection of ten top games from some of Britain's foremost software houses.

Softaid Spotlight

Softaid comes in the usual cassette box with a larger than average inlay card to carry all the games instructions - there is not nearly enough information, but then again there are ten games to cover and you can't get War and Peace onto a postage stamp.

At the start of each side Band Aid have recorded their single. Try not to load this into the 64 as you're really sick; the computer perfects something with a little more time. On loading the games I was a little dismayed to find that three titles would not load, even after many attempts I still haven't seen Guardians, but our failure can almost be overlooked. Of the other nine there are 4 arcade shoot-em-ups, 2 mazy types, 2 platform-level games and 1 semi-adventure called Star Trader.

None of the titles are particularly new but all are good solid games, no rubbish, and if bought separately each could command an £8.00 price tag and you wouldn't feel cheated. My personal favourite up to now must be Asterix's Beamster, a really good old fashioned joystick basher, and Flak by U.S. Gold. Gilligan's Gold and Star Trader also are worth a mention. All the rest deserve a mention as well - this tape is just too good to be true.

Given better instructions, and if all games had loaded, this tape would have received five stars. But still, nobody should be without this compilation.

ADRIJ

Defence-16

Probe Software
\$7.95
C64 or Plus/4 - Keyboard only

GAMES IN THE STYLE OF DEFENDER have been very popular for other machines, though this is the first I have seen for the C64 - and it's a good one!

This is the ideal game for people with aggressive tendencies, because your task is quite simply to shoot everything in sight. Unfortunately the battle is far from one-sided, - the aliens you are fighting are creative, underhand creatures, not averse to such dirty tricks as creeping up on you from behind or forming in on the heat from your engines. This means that as well as shooting you need to dodge, and this is made more difficult by the mountainous terrain over which you are flying. Not surprisingly, hitting a mountain is just as fatal as mid-air collisions with beamers, Landers or Zakoi.

The sound effects are very good and the graphics, though not outstanding, are reasonable. The game really loosens out, however, by having no joystick option. No fewer than seven keys are used to control your craft, so after a while your fingers turn into sticking-sticks!

Pressure, though, as the game is well-programmed and worth buying.

FRB

Las Vegas

**
Aiming
£6.95
CBM 64, VIC 20 & CH

TO BE HONEST I DON'T SEE THE POINT of computerised fruit machines. It's just not the same as playing the real thing and you don't get the sense of actually gambling anything. Having said this Aiming's game is quite playable and there are three versions, one for each computer, so on the one tape. Each includes a fast and reliable turbo-load.

The C64 version's graphics aren't amazing - the reels take up a small part of the left side of the screen, and the rest of the screen is covered in a large number feature grid which has loads of complicated features which flash if you get a certain combination.

The VIC version's graphics are bigger, taking up nearly half of the screen, but it doesn't include all the C64's extra features, having just hold, nudge and gamble. Some of the fruits have numbers, and if enough of these appear on the win line you gain nudges or other 'features'. I found the instructions misleading and in some cases wrong.

Las Vegas claims to give you all the excitement of a casino. It doesn't but if you want a fruit machine it would be worth getting.

FRB





Cauldron

Palace Software
1986
CEM 64 • 50 levels

THE CASSETTE INLAY OF *Cauldron* will convince most people that this rating, in which you pilot a witch on her broomstick, should be added to their collection. The inlay's graphics look good and, just for a change, the screen graphics are, if anything, even better.

The game could have done with a few more instructions, though the publishers obviously do not wish to give too much away in this arcade "adventure", with various

screens requiring a touch of trial and error to discover just what artefacts should be crafted. During the first few plays, a lot of the time was spent finding out how to get about far less start on the quest.

The joystick guides a witch about an ever broadening over a wizard landscape of forest, lakes, volcanoes and mysterious doors. Spells can be learned at naughty ghosts and vampires and other inhabitants of the underworld. Collisions with these spirits drain your magic but this can be replenished at the local magic stations surrounding November 14th quakes. Various doors become apparent as you journey with the witch on her quest through this Halloween landscape and the object, as far

as I could surmise, is to land on the ground (a difficult task in itself) and collect keys with which to unlock the doors to subterranean huts wherein traps, nests and other horrors could be found to increase the witch's power. *Cauldron* is superficially an original game but on the few occasions when I did succeed in reaching the caverns of molten lava behind those locked doors there was more than a hint of platformer in the air.

Despite the lack of instructions the game is well produced and is not of the "play once and shelve it" variety. Sounds very good but nothing special. High scores as far as could be ascertained on achieved were not catered for but graphically the game takes full advantage of the 64.

BM

Carry on laughing

Live Wire
1986
Commodore 64

CARRY ON LAUGHING? I very nearly split my sides! But then perhaps I am getting just a bit too cynical in my old age although there is no hiding the fact that this is not exactly the



best piece of software to come from the Live Wire stable. Fear or famine I suppose, so roll on Christmas. Anyway on with the review.

It comes as no surprise that you are in control of Mr Live Wire himself. He gets around a bit does Mr Live Wire and this time he is the caretaker at St. Theodocimus, an infamous school for deranged computer programmers. Apparently he's getting into a bit of a fix trying to tidy up all the classrooms starting with the dining room and moving on through the biology room, the chemistry lab and braving it all in the computer room. When it comes right down to it this is little more than a fairly basic platform and life game with a number of objectives to achieve and obstacles to avoid.

With only three lives to reserve the going is fairly tough. But when the going is tough, the tough get going and doubtless you will succeed in turning the chaos literally dotted around the screen into ticks. There, I know I could finish on a positive note.

BM

Major Blink

★★★★

CRI

SL/PS

C16

THIS GAME USES A PAINTER TYPE scenario - you must guide Major Bink about a mass of passages painting the area between the paths by moving around the area. As each area is painted,

you gain points. Inevitably life isn't that simple and two sets of mutants try to get you. Firstly, colour blind bears roam down the screen revealing the painted areas. You can shoot these bears but, of course, they keep coming. Secondly, the maze is inhabited by howling abominos which endeavour to catch the Major but which can be temporarily disabled by shooting them. The top portion of the screen is a safe zone and no bears will appear whilst you're in this area. Clear the

screen and move on to the next.

The game makes full use of the C16's colour capabilities and is bright and and very pretty. The design and animation of the figures are neat and effective. Both keyboard and joystick options are available but, for success, a joystick is necessary. The game is both testing, addictive and great fun to play. In view of the memory limitations of the machine, this is an effective game and worth a try.

A.B.

Software Spotlight

3D-Skramble

★★

Universal Software

SL/PS

C16 or Plus/16 - joystick optional

HANDS UP ALL THOSE WHO WANT another version of Skramble. Come on there must be someone. What if I said it was in magnificent 3D perspective? That's slightly better - you're in luck because Universal Software has just released 3D-Skramble for the C16.

3D-Skramble, as a re-hash of the old arcade favourite we all know and love, has you flying through the same old routine, a city, flying saucers and a score of fireballs. At your defence are the manouevring lasers and to stay in the air you must bomb the enemy fuel dumps.

On powering up you are given the option of one or two player mode, you can select any one of ten skill levels and play from either keyboard or joystick - advice the latter, it's far easier. 3D graphics take a little getting used to; to me they looked lumpy and pretty crude. Even the fighter bomber you control is pretty chunky and responds not slowly to the joystick for my liking. In it's favour, there



is good use of colour, but the really outstanding feature of this rather ordinary game is the music. A really stirring rendition of 813 Squadron plays throughout (but can be turned off). Finally the game was of the same standard as the music all would be well.

Overall this game was a bit of a let-down. There are variants of skramble available, albeit not in 3D, which play better. Not even the soundtrack can get this offering more than two stars - the music deserves a better game.

M.T.A.

Out on a Limb

★★★★

Amiga

SL/PS

C16 or Plus/16 - joystick optional

SO JACK SWAPPED HIS MOTHER'S COW for a bean seed and, far from being grateful, she threw it from the window in a temper!

The game starts with Jack leaping from branch to branch to climb the beanstalk, after which he hops through the clouds and crosses the giant's castle. It all sounds very simple, but the beanstalk, the clouds and the castle are infested with weird creatures, whose touch is inevitably fatal. There come in many guises, including magic ducks, killer jelly-babies and demon Hoppers, and these are not easy to avoid. Once in the castle there are 21 rooms to explore, with the eventual aim of finding treasure: a golden egg, a harp and a bag of gold.

Basically this is a platform game, but in scores for its size and sheer quality! On completing one section of the game, the next loads - there are three parts in all, occupying well over 16K. No score is kept as the aim is to get as far as possible in the shortest time - the time elapsed is displayed throughout. The graphics are mediocre, though inclined to flicker, and the sound effects are good.

A very interesting, challenging game - highly recommended!

P.B.

Give my regards to Broad Street

 Amiga Press Software Group
 £7.95
 CBM 40 or joystick

HAVE YOU EVER WANTED TO BE A TAXI driver in central London? If so, a good knowledge of the area's transport system, together with a photographic memory and some experience of human nature would be invaluable. Coincidentally there are also the attributes you need if you are to play *Broad Street* with any chance of success.



You take the part of Paul McCartney in search of a missing album track, pieces of which are in possession of various of your friends. Unfortunately it is a Saturday and your friends are scattered all over London doing whatever they do at weekends. However, being friends, you have a good idea of their interests and habits and as they travel exclusively on the underground you need only to be at the relevant station as they move for them to give you this piece of the song.

To aid you, your car is equipped with a computer linked to the central transport system which informs you of their whereabouts. Using this information together with a road map of the area, you make an inspired guess as to their destination and tear across the city in pursuit - avoiding traffic warden and lunatic drivers - accompanied by a spirited rendering of Band on the Run. There are ten pieces of the song, all of which must be found between 9:00 am and midnight.

The program is a refreshing variation on the maze-type game with good use of 16-bit graphics, sprites and colour. I found it very demanding and highly enjoyable.

DJT



World Series Baseball

 Imagine
 £7.95
 CBM 64 - 1 or 2 joysticks

BEING A GREAT CHARLIE BROWN FAN, I sat down enthusiastically to play this computer version of the American national sport. I soon discovered, though, that I am a player even Charlie Brown's team could beat!

Graphically this game is superb! You are presented with a picture of a baseball stadium as seen from behind home base, complete with fluttering flags and a crowd of spectators. A large screen at the back gives information and a close-up of the

action. All control is by joystick, with the joystick serving a variety of functions at different times. This is rather involved, but logical once you get the hang of it. All the features of the real game are included, even down to a troupe of cheerleaders who appear between innings!

I found the game excellent for two players, but control is so complicated that playing against the computer leads inevitably to humiliating defeat! There are other criticisms too - the ball is very difficult to hit, and the fielder who responds is not always the one you might expect.

On the whole, however, it is well-programmed and I can recommend it, provided you can find two joysticks and a human opponent!

PBB



A bumper book section, this month, includes a look at one of the C16 books hitting the market.

Title:

The Commodore C16/Plus 4

Comparison

Author:

Brian Lloyd

Publisher:

Sunshine Books

Price:

£3.95

COMMODORE'S LONG-ESTABLISHED reputation for producing poor documentation lives on, long after the quality has been substantially improved. Thus, many books have been produced with the advent of new machines. The C16 and Plus4 offer two major advantages to the publisher and author. Firstly the operating systems are identical on the two machines, except for memory size and, in the case of the Plus4, the built-in software. Secondly, there is a potentially large market, on the one hand for the absolute beginner, and on the other hand, for the businessman or businesswoman who wishes to start to make effective use of the machine.

The author has totally ignored the Plus4's built-in software, which is an amazing omission, even for a book containing only 161 pages.

Noting that the author is highly knowledgeable about the Dragon computer, we become curious as to whether he knows as much as he should about Commodore machines. Regrettably it appears not.

For a start, I am not impressed with an approach which includes READ, DATA, and RESTORE commands under the heading 'More Advanced Programming'. They are amongst the easiest commands to understand, and are frequently the group with which beginners become acquainted, as soon as they have overcome the excitement of printing out their name on the screen.

Similarly, the use of the word 'initialise' in the context of READING a disc is likely to cause confusion amongst Commodore users. To such users this expression has always meant reading the Directory and Block Allocation Map into the RAM of the disc drive. To have the meaning suddenly changed to cover the destruction of the contents of the disc is dangerous.

The remark on the back cover suggests that after reading the book, you

REFERENCE



should be proficient in the more sophisticated programming techniques such as disc file handling. This overstates the case. Any disc drive likely to be used with this machine will have Relative Record Files available for random access: there is no mention of this in the book.

The Chapter called 'Structuring your Programs' contains no discussion on how to do this. It contains some information about commands creating program structures such as loops, but DO WHILE and DO UNTIL are not covered, whereas FOR NEXT is. The section in this chapter on LOADING and SAVING programs belongs elsewhere.

The Machine code chapter is only a run through the commands included in the built-in MONITOR.

The chapter on Peripherals glosses dangerously over matters of some importance. The use of the COLLECT command to deal with improperly closed files is covered, but you are not told how to identify such files (by the asterisk appearing on the directory). Similarly, it is suggested that the COPY and BACKUP commands are usable if you have more than one disc drive. This is true enough, but only if those two drives are accommodated in a single disc unit. The distinction is important, and is made clear in Commodore's own documentation!

Rated though it is, this book is written in a more chatty style than Commodore's own documentation, and is therefore considerably easier to understand. However, you would be better advised to wait for books written by more experienced Commodore hands, like Ræna West and Peter Gernard.

Title:

Commodore 64 Basics - A self-teaching guide.

Author:

Ann Harris

Publisher:

Wiley Press

Price:

\$15.95

IT'S ALL VERY NICE ANSWERING THE call to join the high-tech generation and buy a computer, but it's rather difficult to learn to program a computer well if you have absolutely no previous experience. Once you've learnt a language, it's almost trivial to learn a new language or move onto a new machine. It's for these reasons that I enjoy reading good quality teaching books, such as this one, which achieve what they claim.

In true American traditions, this book reinforces the information given by providing occasional questions for the reader to answer. This isn't really my cup of tea, but it does work.

The book sets out to teach you the use of BASIC and give a feel for graphics, sound and data handling. The approach to this problem is to tackle the material in small pieces. The preliminary section deals with the hardware and how to interconnect it. For owners of disc drives, the commands are described in a simple manner. To get you going, simple one line programs are introduced along with how to save and load your creations. The philosophy is simple to help you gain confidence by using the computer. Once

LIBRARY



you realise that you cannot hurt the machine, it's surprising how easy it is to use.

Making progress beyond this point takes some work, to the concepts of flowcharts and algorithms are introduced. Subsequent programs in the book use flowcharts, demonstrating their worth, and the more advanced concepts such as decisions and looping, are discussed with examples of their use and value. The section on programming is completed with a listing for a simple database program using sequential files. While this is probably a good idea for the States where disc drives are common, it isn't for the UK. This aside, it is a useful example of how to write such a program. The remainder of the book discusses simple graphics, sprites and sound. While these subjects aren't covered in great depth, it's a tolerable effort.

On the whole this is a detailed and enjoyable book which reaches the subject of programming in a simple but effective manner.

Title:
Introducing your Commodore 64
Author:
P. K. McBride
Publisher:
Longman
Price: £3.95

ACTION PACKED PROGRAMS, NEW Programming Skills - such is the blurb on the cover of this book, from which one

might assume that here we have a new approach to BASIC; in actual fact this book is full of everything that has been published and introduced while the approach is directed towards those of limited intelligence. A lot of space filled with variations, flaky designs and insane comments.

Quote: How do you make text? Work it out step by step and write it all down. This is your text-making program: unquote. Get the message!

The contents of the book cover a variety of subjects including the inevitable user defined graphics, sprites and sound: the ADVANCED BASIC section is rather retarded; not my cup of tea (ouch).

The best that can be said is that all the programs are functional.

LM.

Title:
The Complete Commodore 64
Author:
Dennis Jarrett
Publisher:
Hutchinson Computer Publishing Company Limited,
Price:
£7.95

THE CLAIM FOR THIS BOOK IS THAT it could be the only 64 book you'll ever need. I doubt it: this is true but as an overview of the Commodore 64 system it is undoubtedly an excellent reference manual.

The book is presented in a lively

manner with each chapter divided into smaller sections, thus making it not only a good, easy read but also a suitable candidate for browsing through in idle moments.

It opens with a level-headed appraisal of the 64 which, though obviously favourable, does not ignore its weaknesses such as rudimentary BASIC and non-standard RS232. This is followed by a potted history of Commodore computers prior to the introduction of the 64 and has an excellent section on Commodore's tantalising projects after the 64 up to the introduction of the Plus/4 and C-16.

At this point the book launches into a clear, concise description of how to set up the machine, finding your way around the keyboard and making the first steps in programming. This last section includes lots of short routines to demonstrate the use of the BASIC reserved words within a program structure.

The sound and graphics functions appear in latter part of this section but the explanations lose none of the crispness of the earlier sections dealing with the relatively easier commands.

The third major section deals with peripherals, after an initial introduction to filing systems. Cassette recorders, disc drives, and printers are all dealt with in a fair amount of detail, giving a far clearer understanding of each unit than you get from their individual manuals.

Unfortunately, there is a serious omission in this section. The 1520 plotter/printer is dealt with very sketchily and the text unfortunately implies that the same commands can be used as for the Commodore dot matrix printers, simply by using the device number instead of 4. This not only underestimates the capabilities of the 1520 but is also incorrect in most cases.

The section on business applications takes a long look at the types of software available with sound advice on choosing the correct package for your own circumstances.

A brief look at the facilities of the 64-64 portable closes this section and leads on to a miscellany of error message types, useful memory POB's, a glossary and bibliography, finally ending with a summary of the available BASIC keywords and a useful memory map.

The Complete Commodore 64 is definitely a must for the relative newcomer to the machine but offers little more for the experienced user and if, as the cover claims, it could be the only 64 book you'll ever need then why bother with a bibliography. The bibliography is obviously a mere cursory glance at the kind of publication available for the 64 - after all, in the section on magazines, a glaring omission is that most essential magazine for 64 owners: Four Commodores!

Big-whiz, Dave Crisp, casts his beady eye over the best of Business software and hardware for the 64.

BUSINESS BONANZA

The Silicon word

WORD PROCESSING IS PROBABLY THE most common serious application for the home computer. At some time, most people want to prepare a well designed and clear letter. The word processor allows you to do this with ease. It also enables you to amend errors before sending the finished letter.

To see us and to see

There are two basic types of word-processing: preformatted and post-formatted. A preformatted word processor shows the document on the screen as it will be printed (with a few exceptions) while, with the post-formatted type, the document does not appear as it will be printed but has certain characters which indicate what will happen to the text. Most post-formatted word processors have a preview facility which allows you to see what the letters will look like when printed.

How and When Measure

Slipstream, to me, is almost perfection. It only lacks an 84 column screen (a limitation of the IBM, of course). It is easy to use and all of the important functions such as word wrap, mail merge, tabulation, decimal tab and so on are there. All the keynotes to format and so on are logical and easy to remember; except for mail merge and file transportation a manual is almost unnecessary. Some of the most impressive features are:

- the facility to insert a new formal line at any time throughout the document. For example, you can insert new tab stops if the style of the letter changes.
- the delete text function. If you press the **Command** key and **delete** key and move the cursor over the text to be deleted, the text changes to white. To insert text you then press the **Command** key and **insert**, and the following text shifts down. You can now type an unlimited amount of text between existing text.

[illegible]

It is vital to receive handoffs of what you see on the screen, although some packages tend to overlook this. Vignette includes all sorts of built-in assistance

which should make it compatible with most printers.

It employs a very effective method to make the most of your printer's extra functions. If your printer uses odd codes to produce such things as italics, sub-

Wing Software 9 Marston Road	Tel: 0834 815700	
Brimscombe		
Colington		
Kenil		
PA17 108		
Microsoft	disc	£78.00
Microsoft	cartridge	108.00
Microsoft	disc	138.00
Microsoft/Apple	disc	199.00

Commercial Business Machines
1 Hunter Road
Watson
Cady
Salem, MA 01970
Tel: 617 299-1155

Emscript	disc	171.00
Emupell	disc	156.00

Simple Software		
Simple Write	also	140,00
Simple Write	conversion	140,00

Audiogenic
at Sumoto Industrial Park
London Road
Reading RG2 9AJ
Tel: 0783 664646

Dunelm Warehouse **disc** **149/95**



VIZAWRITE 64

THE PERSONAL WORD
PROCESSOR

For The Commodore 64 Computer



Vizawrite 64 Word Processing System

Select Activity:-

- F1 - Edit Old Document
- F2 - Create New Document
- F3 - Directory
- F7 - Disk Commands
- F8 - End Of Session

■ Press Required Function Key -

script, or superscript, it is possible to specify the escape code and thus to "DISABLE" that particular function by designating that code to the Commodore key + a number. This is the only word processor I have seen with this specification.

40 column solved

Viza Software have overcome the problem of a 40 column display very effectively. It is possible to enter type as normal in which case the whole screen scrolls to the left as text is inserted (which I find off-putting) or press the Commodore key and W (for width) the text is then re-formatted to 40 columns. Thus, you can see everything you type at all times without the off-putting scroll. If you press the Commodore key and W again, the text is instantly returned to the original width. A post-formatted word processor is alright when churning out blocks of text but I find them hard to use when presentation is important. No doubt, many people will disagree!

words and can learn many more. If you have specialist needs, the dictionary can be edited.

Legally binding

Vizawrite is probably the most expensive of the most popular word processors, but you get what you pay for.

It is equally capable of both home and business use and I know of at least two solicitors' offices where it is their only word processor. With their specialised jargon, the spelling checker is ideal and the time it saves has paid for Vizawrite many times over.

I feel that, if you are going to buy a word processor for the first time, or wish to change your present system, you can't fail with Vizawrite. It's part of my electronic office.

Black marks

One oddity present on Vizawrite is the way in which it uses a micro full stop instead of a space. This is an odd quirk which appears to have no particular function. The micro full stop is too small to get confused with an ordinary full stop but I am at a loss as to why it is there.

My other mean is the start-up colour on the screen. The first thing I do when starting a document is to change the colour combinations to black screen and border with green text.

VIZASTAR 64

THE INFORMATION PROCESSOR



■ Spreadsheet ■ Database ■ Graphs

For The Commodore 64 Computer



Spellbound

44 **Wispell** is a spelling checker which is loaded from within Vizawrite. Once the spell check is over, the processor returns to Vizawrite with two keypresses. There is a built-in dictionary which contains 30000



Silicon spreadsheets

Electronic spreadsheets are possibly one of the most under-appreciated pieces of business software on home computers. In many cases, the spreadsheet is used as a glorified desktop calculator. But, with time and practice, a spreadsheet can be a most valuable tool whenever any type of numeric manipulation and forecasting is required.

Going by the book

A very handy book is *Spreadsheets for Dummies*. It will not only work out formulae for solving specific problems but also has models for cash flow projection, job costing, work analysis and so on which can be converted to work on most good spreadsheets.

Cartridge disc and turbo

VisiCalc is available in 2 different versions - both are on cartridge (40K or 80K) which also require a disc.

The screen display reminds me of the Macintosh screen. It is totally professional with smooth and simple movement around the screen.

BasicCalc is more conventional. One plus is its very impressive turbo load system.

Spill! for choice

In my electronic office, I find it hard to choose between VisiCalc and BasicCalc.

BasicCalc is purely a spreadsheet whereas VisiCalc is also a programmable database. But, both are excellent pieces of software which illustrate just how good a tool the Commodore 64 can be in a business environment. Both work fast - global calculation is noticeably faster than on most of the other spreadsheets listed below.

On the minus side, the manuals are helpful but do not stimulate the imagination. VisiCalc also contains an excellent demo program which points out some possibilities but still leaves the user a little dry.

Setting a standard

Spreadsheets are one of the few programs where a degree of standardisation is present. From my experience, if you press a particular letter, you tend to get the same menu of choices. This does mean that if you are in a situation where you are using a spreadsheet in a business environment on your micro, it would be possible for you to have a similar interoperation on your Jet at home, for development and experimental purposes, this is a tremendous help. I am

aware of one instance where a complete cashflow forecasting model was set up on a 64 and then transferred to a spreadsheet on a Sirius. All the development was done by one man at home.

It is hard to do a spreadsheet justice in a demonstration in a retail outlet. A good demonstration takes time, and in an average chain store, the retailer probably won't know much more than you. Try and find somebody who already owns one, and ask them to let you experiment.

Other offerings

Neither BasicCalc or VisiCalc are cheap but both are well worth the money.

The spreadsheets mentioned below are other goodies. But, beware, there are some spreadsheets lurking around that are so bad that they are hardly worth the disc they are stored on. So, look before you leap!

Visi software
(see above for address)
VisiCalc

disc/cartridge £99.00 inc. V.A.T.

Supersoft
Minichester House
Canning Road
Medchester
Harrow
Middlesex HA2 7G
BasicCalc

Tel: 01-861 5166

disc £75.00

Audiogenic
(see above for address)
Micro World

disc £75.00

Practicorp
Godfield Road
Whitehouse Industrial Estate
Ipswich
Suffolk
IP1 5AP

Tel: 0473 461721

Practicorp II disc £55.00

Money-go-round

Sales ledgers, purchase ledgers, cash books and nominal ledgers deserve a business supplement to themselves. There are several available and the intricacies are such that it is difficult to recommend one in particular.

Incapacitated

Most businesses have the same basic needs as far as ledgers are concerned although the methods used may differ greatly.

One problem many people have when they have been running programs like these for a while is the sudden realisation that they do not have sufficient account capacity. Before buying, make sure that you know how many accounts you have, approximately how many invoices the largest account may have and so on, ensure that the person selling you the package understands your requirements.

Field testing

A problem with reviewing this type of package is field testing. It is possible to enter sets of dummy data and feel that everything looks OK, but, when a program is being used fully and regularly, things can be quite different. I must, therefore, point out that my observations are based either on dummy data or a few weeks' use by a live trial user.

My star buy based on these points is the set of software from Anagram.

Essentially, this is a cashbook, sales ledger and purchase ledger. There are other modules such as stock control but these are not relevant in this context.

Anagram's software has been available for a wide range of Commodore for a long time so the format they have feared has been well tried and tested. They are as easy to use as ledgers can be and are professional packages.

The question of integration

There is no integration but three total integration of modules would be expecting too much of the 64. However, the structuring of the programs is so good that little 'glue work' is required.

The manuals are clear and concise but, if you don't know how to run a ledger, it may be worthwhile investing in a book such as *Bookkeeping Made Simple*.

The sales ledger has help screens in order to prompt you there can be feared for most parts of the program where you may encounter problems. Invoice printing is part of the sales ledger and

posting to the relevant account is done via a separate option. Cash sales are entered into a separate cash account.

The capacity of the software depends on the amount of information that is to be stored on each account. But, Anagram say that it will handle 120 accounts where there is a maximum of 10 invoices per account or 170 accounts where there is a maximum of 20 invoices per account.

Anagram's sales ledger is very comprehensive and would not be out of place in any small business.

Purchase ledger

This includes nominal analysis and is in the same format as the sales ledger, so ease of use is guaranteed. Capacities again depend on how many transactions per customer are needed but, as a guide, Anagram say 100 supplier accounts and 50 nominal accounts with 4 outstanding invoices per account or 75 supplier

accounts with 50 nominal accounts and 10 outstanding invoices per account.

Cashing in

The cash book is the easiest to get to grips with and may be quite enough for business where most trade is done in cash and cannot justify running a sales and purchase ledger. Its capacity is 50 analysis headings with approval mainly 2000 postings of 100 analysis headings with 2000 postings. Once again, reports are complete and very well laid out.

Extra, extra

Company Pack 123 from Imper is very good. Bookkeeping for the cash trader from Quick-Count is also very good as are the others mentioned below. I have intentionally omitted any packages that I found unreliable or too hard to use.

Anagram Systems
10a Queen Street
Haverham
West Sussex
BN11 1AD

Tel: (0455) 59931

Purchase ledger
Sales ledger
Cash Book

£75.00 inc VAT
£75.00 inc VAT
£75.00 inc VAT

Imper Software
Metro House
Second Way
Bromley
Middlesex
HA3 0TY

Tel: 01-800 0999

Company Pack 123
(Sales ledger, Purchase ledger, Bookkeeping, Stock control and Nominal ledger)

£103.79 inc VAT

Quick-Count
15 Abchurch Lane
London
EC4A 3DF
Bookkeeping for Cash Trader

£89.79

Abacus Business Systems
21 Union Street
Ramsbottom
Lancashire

Tel: 076662 7779

Purchase/Sales ledger

£37.95

The printed word

Choosing a printer for your Commodore computer can be difficult. Due to the printer port, some type of interface will be needed in order to connect a non-Commodore printer.

The Commodore MP9801 is the budget printer in the Commodore range but its facilities are rather limited, and the other printers in the range are not particularly easy to obtain.

The answer is to buy another make and the relevant interface. The most popular non-Commodore dot-matrix printer appears to be an Epson compatible Commodore type. These usually offer many facilities not available on the MP9801. Those choosing daisywheel printers are also going for the electronics type.

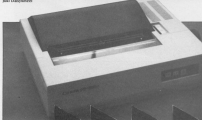
There are a wide range of interfaces to drive a printer. These can either be software based or, what I call, hardware. The software based interfaces consist of a lead and driver software. The disadvantage with this arrangement is that you may find that the driver software conflicts in memory with the program with which you wish to use the printer. There are no such problems with hard units. My particular favourite is the Turboprint GT which was reviewed in the December issue of Your Commodore.

Canon PW-100A

This is a near letter quality dot matrix printer. It is a little on the large side, weighing a hefty 10kg. Its speed is only 700ips in ordinary mode and 25ips in near letter quality mode. I have seen better MQ printers but overall the print quality is very good, and far in a lot better than the Epson. It supports enlarged type, condensed, also, proportional, 8/9 dot graphics and, with a good interface, these options are easy to select. Paper loading is easy except that, if you have pin-feed paper and the lever is set at friction, the paper tears up. There is a 2K printer buffer which is useful on small printers since it is sufficient to release the computer fairly quickly.



Juki Daltysheel



Canon PW-100A

Overall I found this fast, very quiet, and reliable and I would imagine it would be long lasting even with high usage.

MP-165

The Micro Peripherals MP-165 was another MQ printer. Its specifications were fairly close to the Canon even down to Sinclair ZX80/81 type-reaches. This would probably be a wise buy than a Canon. Not only is it cheaper but it also uses Epson FX ribbons which are usually available at even the most humble stationery shop - unlike Canon ribbons which I had

great problems in obtaining. It is not as quiet as the Canon but the level was acceptable. It's MQ made (called line on this) was very good, with the bonus that it could be turned on part way through text print. With a little practice I found I could highlight paragraphs by pressing the 'line' switch at the start of the paragraph and pressing it again at the end.

Like the Canon, this appeared to be a workhorse.

The JUKI Daltysheel

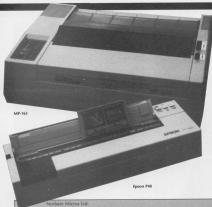
This typewriter/printer is for those of you who are prepared to sacrifice speed for high quality printout. The Juki is so

slow in fact that I found I could type faster than it could print (... unusual but a great ego booster).

The Juki does have the advantage of being a typewriter as well but I would imagine this would be the choice of the irregular, low volume user.

It has some nice touches such as delete mode: you can go back over a mistake, 'lift' the old character, and overwrite with the correct character. It also supported decimal tabs and centring of text, but the quality left a little to be desired and it did look like a budget machine.

The ribbon only lasted a few



days and my attempts to obtain a new ribbon proved futile and so it sits here unused and unloved.

The Epson

This is rather different to the other three printers mentioned here. It is a dot matrix printer with what I would call fairly standard Epson specifications, i.e., enlarged, condensed, emphasized, double strike, underline, italics and graphics modes. However, here is the difference: 280 mm/s ■ 62 mm/s ■ 92 mm/s.

For those of you (like me) that were born before 1960 that could be about as big as a London bus. In fact it is about 11 inches wide ■ 11 inches deep and 23 inches high.

Small, yes, but packed full of fun. It will print on ordinary paper or heat sensitive paper. It is fraction led and, if you have a portable, it is mains or nickel cad battery powered.

A full 80 column print-out might make you think that the end result was printed out on one of its bigger brothers, and for only £160 (approx) it's on the cheap side too. It is not particularly fast (40cps/max) but for the convenience of a mini printer, its speed is worth tolerating.

The print quality is very good. There is a variable density setting so you should get a reasonable printout on most paper although smooth is recommended. The type face is very obviously Epson but that is not a bad thing.

For anybody who finds space a problem this may well be the answer. Here all I need is to get my 10-60 running on an Eps Ready PPS.

Summing up

This has been a very brief look at just four of the wide range of printers that can be hooked up to the 64. Before you buy a printer, check the ribbon situation. If the lid breaks the printer will still work, if the case splits, the printer will still work, but if you cannot get a spare ribbon you are stuck!

Norfolk Micros Ltd.
Norfolk House
Boulton Road
Reading
Series RC2 S.T
Turkopton/CT

Tel: 0734 751201

265

Canon UK Ltd
Canon House
2 Manor Road
Millington
Surrey GU4 0BW
Canon P30-300a

Tel: 01-773 3173

£399

Micro Peripherals Ltd.
Inter Link 3
Hammer Wood
Wade Road
Basingstoke
Hants RG24 0NE
MP-142

Tel: 0235 471222

£299

John (Europe) Co Ltd
c/o Alden Instruments Ltd.
28 Burnt Mill
Harlow
Essex CM20 3HU
J401 2288

Tel: 0279 445511

£299

Epson (UK)
Overland House
380 High Road
Wembley
Middlesex HA8 5UH
Epson P-40

01-962 18962

£199

File and release

Rooming Filter	Ceiling Screen
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When you are in front of a screen for any length of time, even the smallest reflections can be a source of great irritation. The Ramap Coal screen helps ease the problem. At its price it is remarkable value. It is glass as opposed to plastic and does get rid of all but the most direct reflections.

Video strips are used to line the screens to your monitor/TV which is a little crude, but certainly beat worse than it is. Lamp sale. There is little loss of picture quality with the screens in place and the whole effect is more useful to the eye. Because of the high density of the screen you will need to increase the brightness quite a lot. There are other screens available but most appear to be above £100. This is a crude but effective solution at a fraction of the cost. A good gift for the computerless operator.

Learning Goals

Tel: 0201-271 5000
1700 000 000

Tom Hesterman
149 E. Imperial (Nash House)
Corral Terrace
NRE SPA
1000 California Road

1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 26

Impen Software Ltd.
Motto House
Second Way
Worthing
Worthing BN14 9TY
Telephone 01323 854444 ext. 404

Test: (01-200) 000000

Zero 80 Column Card

This is a sophisticated piece of kit which isn't cheap. But for the money, they could have provided a decent manual rather than the Double Dutch translation which passes for a manual.

The display was very impressive - clear text, easily read and a digital clock in the

corner. Ah! ja. The clock. It is about as accurate as Heri Davies putting a black. The time on the clock appears to be Dutch summer time!

The word processor provided is not too bad if you like the post-formatted type and it does have a preview facility.

On the whole it is a nice tool. It does not function with

much commercial software but, if you write a lot of your own programs and feel they would look better in 80-column mode, then this would be a useful thing to get.

It certainly beats the Impen-
Terview. I tried this on three
monitors and the text was
barely readable. I was surprised
since Impen releases are
usually good.

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64 CHARACTER SET

[illegible]

100

Provide your
Commodore 64 with
an extra character set
with this utility from
L.A. Wolfe

THE FEATURES OF THE
colony are as follows:

While providing the alternative characters, the original built-in 'alpha' characters are still accessible although the left-hand graphics are lost and the numeric keys are converted to the new numeric set.

because the new 'alpha' character set and are accessed by using the shift key with the usual character key. This means that long strings or print statements may be easily entered by using the 'shift lock' key.

- 3) Pressing "run stop" and "restart" will reset the standard character set.
- 4) Many other user defined graphic routines consume a lot of memory, but this program only uses 1788 bytes, leaving an ample 17288 bytes free in which to store your program.
- 5) The new characters are held in locations 12672 to 12799 and 12800 to 12825.
- 6) You may have the two character sets displayed on the screen simultaneously.

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special offer and dazzle your
friends with your amazing
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CHARACTER DESIGNER

CONGRATULATIONS! YOU'VE WON the chance to add truly professional graphics to your programs. No, we're not going to provide our readers with their very own Tony Designer clones but we believe we can offer the next best alternative - a character designer used by a major software house to create its own best-selling games.

Your Commodore, in conjunction with Home Computing Weekly, are offering Virgin Games' **Character Designer** at a price we're sure are of our readers can afford. For 99p, plus a few hours spent studying the documentation on the following pages, you could soon be emulating (or maybe even surpassing) the works of art screaming from the screens of games such as Falcon Patrol II, Hammer and Virgin's latest Arcade Adventure, Gates of Dawn.

But, that's not all. With your Character Designer, you will receive a competition coupon which will allow you to enter the Your Commodore/Home Computing Weekly 'Design a screen' competition.

Once you've got to grips with your Character Designer, use it to design a screen. Send your work of art to Virgin Games before the closing date of July 31st, 1985. The winner will be the reader who, in the eyes of our panel of judges, has produced the most professional and artistic screen with the assistance of their Character Designer. The panel of judges consists of Jeremy Cooke of Virgin Games, and the editors of Your Commodore and Home Computing Weekly.

And, the prize! The first prize will be a day at Virgin Games and the thrill of seeing your graphics used in a Virgin game. The 40 runners up will each receive a copy of Virgin's Gates of Dawn. How could any aspiring programmer resist such an offer?

Don't delay! Fill in the coupon below and send it with your cheque for 99p, made payable to Virgin Games, to: Virgin Games Ltd.

3-4 Vernon Yard London W11.

THIS EXTREMELY POWERFUL PIECE OF professional software allows you to edit up to four individual character sets containing 256 characters each - a total of 1024 characters - in memory simultaneously. The use of raster interrupt techniques enables the entire character set to be redefined without affecting the main screen display.

With most character designers if you redefine your alphabet to look like, say, space invaders the on-screen prompts will turn to space invaders too! Not to with Character Designer!

screen or to design a screen for use in a BASIC or machine code program.

Loading

To load type: LOAD"/1" (7,1) (press ENTER)

To run type: SYS 16384 (press ENTER)

This program requires a joystick plugged into port 2.

If the computer has just been switched on or you haven't loaded a character set, the bottom of the screen will contain garbage, both in the character set itself



Gates of Dawn

Although designed for the professional user Character Designer is extremely user-friendly and suitable for anyone who is willing to spend a little time reading this documentation to familiarise themselves with the scope of commands. All commands are entered with a single keypress, or via the joystick, and a help screen is available displaying the options.

The program is written in 100% machine code and occupies only 1K of memory including the HELP screen. It also includes a screen designer enabling you to see the characters in combination with

and in the space above. The six lines above the set are all spaces (character 32). You can rid yourself of this onerousness by redefining character 32 to be totally devoid of 'set' pixels and thus a genuine empty space. Alternatively you could copy one of the Commodore sets, or load a previously saved set.

If at any time you return to BASIC by hitting RUN/STOP and RESTORE, the program can be restarted without loss of data using SYS 16384.

If you wish to have a small BASIC program in memory at the same time as Character Designer, after loading Character Designer type: POKE 12,15:POKE 56,15:MEM to lower the top of memory to 3648 then load your program and enter SYS 16384.

Character sets

On the Commodore 64 all graphics are handled by the dedicated VIC II chip. One drawback of this chip is that it can only look at 16K of memory at a time. This 16K needs to contain all of the data for the

Name
Address
Postcode

Please send me ... Character Designer(s) at 99p each.

to: VIRGIN GAMES LTD, 3-4 VERNON YARD, LONDON W11.



character sets), sprites and screen data (see Memory Map).

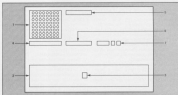
If a screen is drawn in bit-mapped, 96 of memory is used in total out of the 16K available, which is why most commercial programs need to use a character mode, but instead of firing letters these are referred to make up a small part of the picture and are then placed together on the screen.

To define such characters without the aid of a utility such as Character Designer involves sketching your design on graph paper, testing your binary arithmetic converting the sketches to data, typing in endless lists of data statements and then finally running a BASIC program to POKE the characters into memory.

Character Designer allows you to do the TV screen or monitor instead of graph paper, then it does all of the calculations and POKING to memory. This data is saved to tape or disc as a block of memory which can be loaded from within a BASIC program or as part of a machine code program eliminating the time-consuming use of GOTO statements.

Character Designer enables you to work on 804 characters in memory at the same time. These are divided into four sets of 256 characters, each occupying 2K of memory. Your program can use any of these sets instead of the Commodore sets and even switch between sets during a program with a simple POKE (see Switching Character Sets).

You could redefine the alphabet to give you, say, gothic script or italics or even a futuristic character set for use in your latest space epic. Or maybe by defining blocks of characters as walls, trees etc, you can create amazing backgrounds over which sprites can dominate, or whatever it is sprites care to do! At the risk of sounding clichéd, the only limit is your imagination!



Colour table

One method often used in commercial software to save time and memory and help simplify programming in multi-screen games is to allocate a colour to each character. This method is used by Character Designer.

The character designer section allows you to set the colour of each character. This colour is stored in a 256-byte table (one byte for each character in the set) and is primarily used by the screen designer when printing a character.

As with the character set the colour table can be saved to tape or disc and loaded again for use in your own program.

Memory map

The diagram below shows how Character Designer is located in RAM along with the character sets, colour table etc. (see also Programmer's Reference Guide, pp 184-185).

How Character Designer is located in RAM			
Hex		Decimal	
[7K bytes]	Designed screen	\$6400	25600
		\$6000	24376
		\$5800	23760
[2K bytes]	Colour table	\$5400	21504
		\$5000	20480
		\$4800	19456
Program loads here (1K)		\$4000	16384
Redefinable character sets (2K each)	Set 2	\$3000	12288
	Set 3	\$2800	11264
	Set 4	\$2600	10240
		\$2400	9216
Commodore character generator (ROM image not definable)	Set 3	\$1000	4096
	CBM L/C L/C		
[8K bytes]	Set 2	\$1800	6912
	CBM L/C graphics		
[8K bytes]	Cursor-sprite	\$0F00	4032

Using the Character Designer Screen layout

- 1 Grid on which an 8 x 8 typical character can be edited.
- 2 Character set: the current set of 256 characters.
- 3 Cursor indicating character being edited.
- 4 Character being edited, displayed along with its "POKE" value.
- 5 Mode indicator: current process. Should read EDIT or SELECT.
- 6 Current set, numbered from 0 to 3.
- 7 Multi-colour indicator: reads ON or OFF. The coloured figures show the selected multi-colours.

As mentioned in the section on loading Character Designer is run by typing SYS8084. If the computer has just been switched on or you haven't loaded a character set the bottom of the screen will contain garbage, both in the character set itself and in the space above. (The six lines above the set all contain "spaces" i.e. character 32). When you run Character Designer the screen will appear full of unsightly garbage. Clearing character 32 of any set pixels (making it a true empty space) will clear the top six lines and loading a Commodore character set or one of your own will make sense out of the bottom lines.

Select mode

This is the mode of the designer when first run, allowing you to move quickly to any character. Using the joystick in port 2 the character to be edited, indicated by the flashing cursor, can be selected from the current character set. The cursor can be moved in all four directions. When the fire button or any key is pressed the designer goes into EDIT mode.

Edit mode

Once your chosen character has been selected and button or key pressed you will be in EDIT mode. As suggested by the

name, all editing commands are entered in this mode. The most important function is the ability to turn on or off individual data on the grid, which correspond to pixels of the character. The purple filled circles indicate "on" pixels while the green hollow circles indicate "off" pixels. The white circle is the cursor, controlled by the joystick. Pressing the fire button switches the pixel from off to on or vice versa. The actual character can be seen below the grid.

As well as being able to design the character directly, there are a large number of commands that can be input from the keyboard. These are described as follows.

Editing commands

The commands are all initiated with a single key press and are detailed in the codes they appear on the HELP screen.

1 Left arrow and up arrow — move
These keys move the character on the grid horizontally and vertically respectively. NB. These are not the cursor keys but the keys to the left of the "0" key and to the right of the "9" key.

2 Invert
Inverts the character on the grid i.e. all "on" pixel off or vice versa.

3 R — Rotate
Each press of "R" rotates the current character 90 degrees anticlockwise.

4 Cursor keys
These move the character on the grid one pixel in the appropriate direction with full wrap-around.

5 Shift/COL
Clears the grid, making the current character a space.

6 Home
Returns the cursor to the top left of the grid.

7 C — Copy
This powerful command enables any character from any of the four sets to be copied to the current character. When "C" is pressed the mode changes to "COPY", the bottom cursor stops flashing, and the prompt "SET?" appears. If the "1" key is pressed the designer cycles through the four sets (as described under LOCATE). When the desired set is located, or if you wish to copy from the set on show, simply move the joystick or press the button. The prompt will change to "CHAR?" and the cursor will start flashing. The character to be copied can now be chosen with the joystick as described later in the section dealing with SELECT MODE, i.e. as soon as the button is pressed that character and its colour will be copied to the current character.

8 X — exchange
This enables the current character to be swapped with another character from the same set. On pressing "X" the mode changes to "EXCHANGE". Simply select the character with which to swap the

current character by moving the joystick until the cursor covers it and then press the button or any key.

9 CBA/C — CBA/CYC
Will copy the entire upper case Commodore set into the current set. The mode will change to "CBA/CYC". If you do not wish to copy the set press "W" otherwise press any other key to complete the copy.

10 CBA/T — CBA/TC
As above but will copy the lower case Commodore set.

10 L — Location
This is used to choose which character set to edit (sets four to seven). Pressing "L" moves you to the next set. If the current set is seven, the next will be four.

12 S — Select
This puts the designer into SELECT mode.

13 M — Next
Will advance to the next character. If the current character is 255, this will have no effect.

14 P — Previous
Will go back to the previous character. If the current character is 0 this will have no effect.

current row. This is then repeated for the remaining seven rows.

16 D — Data
This puts eight items of data in decimal alongside the character. This list will disappear when any key is pressed.

17 F1 — Character colour
Advances the colour of the current character.

18 F2 — Multi-colour 1
Advances multi-colour 1.

19 F3 — Multi-colour 2
Advances multi-colour 2.

20 F7 — Background
Advances background colour.

21 SHIFT/RT/BL — Border
Advances border colour.

22 M — Multicolour ON/OFF
Turns multicolour mode on or off.

23 C — Colour all
Will change every character colour to the colour of the current one.

24 Shift/C — Load
Loads a file. See Cassette and Disc Operation.

25 Shift/S — Save set
Will save the current character set.



Screen shot of Character Designer

15 SHIFT/N — Number
This allows you to input a character as eight decimal numbers. When SHIFT/N is pressed the mode will change to "NUMBER" and a prompt "N?" will appear by the top row of the grid. A decimal number (0-255) can be typed in followed by RETURN. If a number greater than 255 is entered it will disappear leaving just the prompt. If there is no number following the prompt when RETURN is pressed it will have no effect on the

26 Shift/C — Save colour table
Will save colour table.

27 Shift/A — Save screen
Will save the designed screen.

28 H — Help
Will display the HELP screen.

29 Q — Quit
Will enter the Screen Designer.

Alt Where the instructions say "press any key" (e.g. to leave SELECT mode) if the key pressed is a valid editing command it will then be executed.

Cassette and disc operation

These are the system messages as they appear on-screen:

SAVE COLOURS Type of save or load
CASSETTE OR DISC Type of device you are using
FILENAME (XXXX) The name you give your file

then:

PRESS RECORD AND PLAY ON TAPE

OK

SAVING BRICKS

PRESS ANY KEY

When any load or save command is entered the screen will clear and the following will appear:

- The type of operation (LOAD, SAVE, CHANGE, SAVE COLOURS or SAVE SCREEN)
- Select device - press C or D to select cassette or disc, followed by RETURN to confirm your choice. Character Designer will remember the previous device used, so normally you will just need to press RETURN.
- A filename of up to 16 characters can be entered from the keyboard followed by RETURN. Delete may be used as normal but the cursor keys and INSERT will not work. The only occasion on which a null file name can be used is during a cassette load. When using a disc drive "FILENAME" can be used for a save and replace and subbank can be used for loading.

If using cassette the border will change to light blue and the prompt "PRESS PLAY ON TAPE" or "PRESS RECORD & PLAY ON TAPE" will appear. The screen will then blank and your Commodore 64 will load or save in the normal manner.

- After the load or save is completed, pressing any key will return you to the designer in SELECT mode.

Screen designer

To enter the Screen Designer section of Character Designer press "Q" in EDIT or SELECT mode. If no screen has been designed or loaded you will see a screen full of garbage. Press SHIFT-CLR to clear the screen.

At the top left of the screen a white cursor will be visible; this can be moved around with the joystick. Pressing FIRE will put the current character at the cursor position. The character can be changed either by returning to the character designer and SELECTing a different character, or by pressing "V" or "G" (see below).

NE Only characters from the same set may be used on screen at any one time. The set used by the Screen Designer will be that currently chosen in character designer mode.

Summary of screen designer commands

SHIFT-CLR Clear screen
HOME Home cursor
SPACE Put a space at cursor position
FIRE BUTTON Put current character at cursor position with colour from colour table

- G** get new character - if G is pressed the character under the cursor becomes the current one.
T enter TEXT mode. The cursor will turn green and text can be entered from the keyboard. To exit TEXT mode press RETURN.
RETURN **NE** Text mode assumes that the alphabet is in the normal Commodore upper case position, i.e. A-Z, Z-26.
Q quit Screen Designer and return to Character Designer in SELECT mode.



by copyright

- D** Display current character at cursor position. When "D" is released the character will disappear.
F1 change cursor colour from white to black or vice versa

- S** select a new character; this will only work if the cursor is on the bottom eight lines. These bottom eight lines will be replaced by the current character set. The cursor may be moved around as usual and pressing FIRE will select the character under the cursor. No other commands will work while the character set is displayed. The set will turn off automatically when the cursor is moved out of the bottom eight lines and the bottom of your screen will appear unharmed.

Hints and tips

This section is intended for the beginner but contains much information of use to the more advanced user.

Creating multi-colour graphics

In its normal hi-resolution colour mode the Commodore 64 can only display two colours in each character square: the background colour and the character colour. Luckily it is possible to display four colours in one square at the cost of halving the horizontal resolution. Although this gives the graphics a slightly chunky look, much more colourful displays are possible.

Instead of a character being eight pixels wide, as in hi-res colour, a multi-colour character is only four pixels across, each pixel being twice the width of a hi-res pixel. This means that with Character Designer we are able to use two dots for each of the four horizontal pixels with the

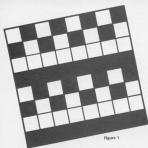


Figure 1



Figure 2

colour chosen according to the chart below:

OFF OFF	Background colour
ON ON	Multi-colour one
ON OFF	Multi-colour two
ON ON	Character colour

You will notice that the chart says that when both bits are "on" the double pixel will be displayed in the character colour. This is not quite true. If the character colour is between 0 and 7 (black to yellow) the character will be displayed in hi-res. If the colour is between eight and 15 it will be displayed in multi-colour with the character colour appearing as character colour minus eight, e.g. if the character colour is 10 (light red) and multi-colour is on, any double pixels with both bits "on" will appear as colour 10 - 8 = 2 (red).

To demonstrate this try setting multi-colour one to light blue, multi-colour two to white and the character colour to red and switch multi-colour ON. Then enter the following data into a spare character using NUMMER:

BS, 170, 0, 255, 05, 170, 0, 255

You should see a red character like Figure 1. Now use F1 to advance the colour to yellow. Press F1 three more times and the characters should look like Figure 2.

You will notice that we are restricted to using the first eight colours (the ones printed on the keys) when using multi-colour, but if we wish to have the character actually appear in multi-colour we need to add eight to the desired colour code. No such restriction applies to the multi-colour themselves where we can choose from all 16 colours. (See also Programmer's Reference Guide pp T15-T18.)

Using graphics in your own programs

If you wish to use a character set you have designed in your own program you will need to use a program similar to the one that follows:

```
1 X = 0
2 IF X = 1 THEN LOAD "CHARS", 1
3 REM YOUR PROGRAM
```

When run this program will firstly load the file called "CHARS", assuming of course that it is saved on tape after your program or you change tapes after your program has loaded. This will cause the 64 to continue running the program from the first time. (After a LOAD from within a program the 64 performs the equivalent of a GOTO (line line) retaining all variables.) After loading "CHARS" X will no longer be equal to one, so your program will run as normal. This will also work with several files as below:

```
1 X = X + 1
2 IF X = 1 THEN LOAD "CHARS", 1
3 IF X = 2 THEN LOAD "COLOURS", 1
4 IF X = 3 THEN LOAD "SCREEN", 1
5 REM YOUR PROGRAM
```

You will need the programs saved to tape in the following order:

1 Your program 2 "Chars" 3 "Colours" 4 "Screen"

While developing a program you might like to have the files saved on separate tapes. In that case by putting some sort of prompt in line one:

```
1 X = X + 1: IF X=4 THEN PRINT
```

"CHANGE TAPE THEN PRESS ANYKEY":
WAIT 198.5:POKE 198

HS: WAIT 198.5 will stop the program until you press a key and the POKE will clear the keyboard buffer.)

Switching character sets

To choose which character set to use POKE \$107LS where X is one of the following values.

X	Set	Comments
29	2	Commodore Upper case (default)
22	3	Commodore Lower case
24	4	
26	5	
28	6	
30	7	

Note that if you move the screen from its normal position (1624 - 3023) the value of X will need to be changed accordingly. See also Programmer's Reference Guide pp. 103-104.

Turning multi-colour on and off

To turn multi-colour mode on POKE \$1070, PEK (\$1070) OR 16.
To turn multi-colour mode off POKE \$1070, PEK (\$1070) AND 255

POKEing the screen

Printing to the screen using strings of cursor characters is a rather tedious method and also suffers from a certain sluggishness. It is often better to POKE directly to the screen memory.

If we first assign the following variables:

```
X = column number (0 - 255)
Y = row number (0 - 24)
SCREEN = 1624 (this is the usual position but it can be altered)
COLOUR = 52296 (the start of colour memory)
```

the addresses to be POKE'd can be simply worked out with the following formulae:

```
P1 = 40 * Y + X
POKE SCREEN + P1, (character number)
POKE COLOUR + P1, (colour code)
```

```
PO
100 Y = 20: Y = 15
110 P1 = 40 * Y + X
120 POKE SCREEN + P1, I
130 POKE COLOUR + P1, J
```

will print a white "A" near the centre of the screen (provided that SCREEN and COLOUR have already been defined).

Using the colour table

In addition to defining SCREEN and COLOUR, we define another variable CTAB = 21504

```
and use CHAR to hold the character number, the following subroutine will print a character using the colour table created with Character Designer.
100 P1 = 40 * Y + X
110 POKE SCREEN + P1, CHAR
120 POKE COLOUR + P1, PEEK (CTAB + CHAR)
130 RETURN
```

Background and border colours

To get the colours of the background, border and the multi-colours:

```
Border - POKE 53289,X
Background - POKE 53291,X
Multi-colour 1 - POKE 53292,X
Multi-colour 2 - POKE 53293,X
```

where X represents one of the following colours:

- | | |
|----------|----------------|
| 0 Black | 8 Orange |
| 1 White | 9 Brown |
| 2 Red | 10 Light red |
| 3 Cyan | 11 Dark grey |
| 4 Purple | 12 Medium grey |
| 5 Green | 13 Light green |
| 6 Blue | 14 Light blue |
| 7 Yellow | 15 Light grey |

Downloading a screen

You may wish to use a screen you have designed using Character Designer in your own programs. To do this set up the background, border and multi-colours, choose the character set and turn multi-colour on or off as desired, then use one of the following subroutines to download the desired screen on to the real screen. NB: You must have loaded the screen, character set and colour table beforehand.

```
BASIC
1000 SCREEN = 1624: COLOUR = 52296: CTAB = 21504
1010 S1 = 24576: REM
DESIGNED SCREEN
1020 FOR I = 0 TO 600
1030 CH = PEEK(S1 + I)
1040 POKE SCREEN + I, CH
1050 POKE COLOUR + I, PEEK (CTAB + CH)
1060 NEXT I
1070 RETURN
```

```
1000 POKE 50945: READ A:
Code Load: POKE 49952: A, A: NEXT
1010 DATA 14, 168, 216, 131, 196,
168, 4, 110, 252
1020 DATA 168, 96, 131, 254, 160,
0, 112, 195
1030 DATA 132, 128, 130, 253,
177, 253, 146, 251
1040 DATA 170, 169, 84, 145,
195, 208, 208
1050 DATA 248, 230, 196, 238,
253, 208, 204, 160
1060 DATA 234, 208, 160, 208,
230, 16
```

To download the screen type: SYS 49952 (RETURN)
NB: This program will overwrite any sprite pointers.

Moving blocks of memory

There may be times when you wish to move a character set, screen or even a colour table to a different place in memory. The short program below will do this for you.

```
10 FOR I = 0 TO LL-1
20 POKE (D) + I, PEEK (S) + I
30 NEXT I
```

Where LL is number of bytes to be moved as follows:

```
Character set 2048
Screen 1600
Colour table 256
```

D() = the address you want to move the block to
S() = the address you want to move from (see the Memory Map)

Sprites

If you wish to use sprites in your program, remember to leave room for your sprite data. (The space occupied by a character set can hold the data for 32 sprites). Note also that the space occupied by the ROM image (bits two and three) can't be used for sprite data.

Banking the VIC chip

As mentioned earlier, the VIC II chip can only look at 16K of memory at a time. It usually uses the first 16K of memory. This can cause problems as any character sets or sprites limit the amount of memory available to BASIC.

One solution to this is to move the VIC chip to a different location. The only 16K that is completely free is that from 16384 to 32767.

This is done using the following commands:

```
POKE 16376, PEEK(16376) OR 1
POKE 16376, PEEK(16376) AND 255 OR 3
```

Now all of the character sets, sprite data, and screen locations will need to have 16384 added to their addresses. The program in the section Moving Blocks of Memory can be used to move the character sets. (See also Programmer's Reference Guide pp 100-102.)

The example sets

Included in the package are two example character sets. The first, ADVENT.SET is a "gothic" style alphabet together with some characters to make up a picture of the type in many graphic adventures. This loads into the designer at SET 5. The associated colour table and screen are called ADVENTCLR and ADVENTSCR respectively. For this set multi-colour mode needs to be on and the multi-colours should be light grey and midgrey.

The second example, which loads at SET 6, is a double-sized alphabet that could be used in an educational program along with a picture of a caddy-top. The files are called TIDDY.SET, TIDDYCLR and TIDDYSCR. To see the picture properly, multi-colour mode has to be switched off. A rather challenging exercise might be to write a program to convert an ASCII string to these double height characters and PRINT or POKE them to the screen.

Bibliography There are many, many books on the market about the Commodore 64, especially concerning graphics. There is only one which is absolutely essential and has been referred to throughout this manual: Commodore 64 Reference Guide, published by Commodore.

Allen Webb doodles with
Cheetah's sweet talker and
RAT.

Sweet Talker
\$34.95

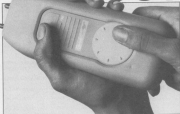
IN COMPARISON WITH MANY OTHER products of its type, the Sweet Talker speech synthesizer comes in the form of a cartridge. The bonus with this product is that it is connected to the user port. This means that the cartridge slot is left available. Since the Sweet Talker does not interfere with the operating system, it can be left in place most of the time. The audio output leaves via the audio/video connector.

This package uses the allophone approach to generating speech. This means that rather than having a fixed vocabulary of words, you are given the ability to create a huge range of sounds. This is achieved by splitting speech into sounds or allophones. These are combined, rather like syllables, to create words. The system adopted by Cheetah, however, is somewhat fiddly. Each allophone must be converted to a numerical code and this code used in a machine code routine to create the sound. This means that you must perform the tedious task of converting words into allophones and then converting the allophones to data. I have seen better approaches to dealing with this problem.

The clarity of the speech generated by Sweet Talker is good but has a rather mechanical timbre similar to that TV favourite Metal Mickey. The absence of intonation somewhat hinders the flexibility of the system, but the quality is above average. The package comes with a demonstration cassette.

Overall, this is a good product which is worthy of serious consideration.

CHEETAH SPEAKS OUT



Cheetah gets RA!ed!

RAT (Remote Action Transmitter)
\$29.95
C&M

MOST OF US OATH JOYSTICKS AND appreciate the limitations of using a cable to connect it to the computer. The RAT is an alternative approach to joystick control. The system operates in a manner similar to remote control TV systems and comprises a transmitter which you hold and a receiver which plugs into the

joystick ports. When you press a control on the transmitter, an infrared signal is sent to the receiver. This is converted into a form which the computer can interpret. The upshot of this is that you can sit in your easy chair and play space invaders on your computer at the other end of the room.

The transmitter is not so much a joystick as a pressure sensitive pad. A disc with eight dimples provides the usual joystick type movement. The dimples are provided to give a tactile reference point so that you know which bit you're pressing. A single pressure pad provides a fire option.

The first obvious impression you get when using the RAT is that it's trickier to use than a joystick. I found it difficult to press a specified position quickly; this was particularly crucial on games such as Impossible Mission which require dexterity. No doubt with a lot of practice it will be possible to achieve sufficient skill on the RAT, but many may find it daunting. Couple this aspect with its high price and you have a product which may have a limited market. This aside, it is a very well-made product which functions faultlessly.



A sweet-talking box

EEEEEEEEEEEEEEEEEEEE

DOG FIGHT

**Can you win the
battle of the skies in
this high flying game
from P.G. Tout.**

AS THE ACS PILOT IN control of a spanking new fighter your aim is to score in and destroy the flagging, archaic bi-planes of your enemy. You score 10 points for each plane you blast out of the sky.

There is a timer at the bottom of the screen. When this reaches the right hand side,

you will progress to the next level, picking up 1000 points bonus and an extra life.

The joystick must be placed in port 2. Normal joystick movements apply. Press space to return to the title page.

Variables

V	= Video chip
S1, S2, S3	= Sound
T	= Timer
S	= Score
H	= High score
L	= Lives
Le	= Level
Sp	= Speed
Z	= Timer
Co	= Colour

Program Information

Part 1

This is sprite and graphics data

Part 2

This is all machine code

Part 3

1	Set graphics pointer
20	Load variables
40 - 90	Set sprite position and colours
110	Set variables
115 - 199	Main loop/routine
1000 - 1040	Print score board etc.
2000 - 2015	Crash routine
3000 - 3012	Increase levels
5000 - 5010	Game over
60000 - 60711	Title page
61000 - 61780	Title page music
62000 - 62070	Choose level
63000 - 63000	Instructions



Program Listing 1

10 000000
 11 000000
 12 000000
 13 000000
 14 000000
 15 000000
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 89 000000
 90 000000
 91 000000
 92 000000
 93 000000
 94 000000
 95 000000
 96 000000
 97 000000
 98 000000
 99 000000
 100 000000

[illegible]

Program Listing 1

[illegible]

Nick McCallen's

machine code routine
will automatically find
and access the
character memory and
format of a VIC high
resolution screen.

HI-RES VIC

IN ORDER TO UNDERSTAND the operation of this routine, some understanding of the relationship between character memory and what appears on the screen is necessary. So, for the benefit of those types here a brief explanation.

When the VIC is used in normal (text) mode, each screen location may display a character which is made up of eight rows of dots (pixels). Each pixel row is in fact one byte of the character memory, each of whose bits may be 'on' or 'off' to provide the dots on the screen which make up the character (see Figure 1). Therefore the character memory is made up blocks of eight bytes, each block forming one character. In text mode, these blocks are fixed.

In hi-res mode, a temporary character memory (C.M.) is created in RAM, with all its bits initially 'off' (i.e. '0' or blank). Using the techniques outlined below, each bit may be turned on or off by a plotting routine. In order to do this in a controlled manner, each screen location is linked or 'mapped' to a third block of bytes in the temporary character memory. Each block may be of eight or sixteen bytes, according to how the VIC is set up.

A common technique of bit-mapping is shown in Listing 1, and results in successive screen locations being mapped to successive C.M. byte-blocks, as illustrated by Figure 2. For the sake of illustration the screen is taken to start at 7680 (8000), with the C.M. at 4096 (41000).

As can be seen, this results in the C.M. bytes being displayed in successive blocks along the screen line. This is easy to achieve, but makes life awkward for a printer with a

quable dot matrix, as is the case with many printers run off Commodore computers. To make a printer of hi-res screens easier to obtain on most Commodore, Seiko and other cheapish dot matrix printers, a different bit mapping technique can be used.

In this alternative method, vertical columns of screen locations are mapped to successive C.M. blocks (see Figure 1 and Listing 2) so that slicing out blocks of seven pixel rows does not demand too much counter juggling. It also means the solution of another problem: instead of individual bytes representing a horizontal pixel row, the printer expects a byte to represent a VERTICAL column of pixels (see Figure 3). The eighth bit in each printer byte is not actually part of the character block which appears on paper.

There are two other advantages in using this

alternative method. Firstly the arrangement of the C.M. is constant whether we use 8x8 or 8x16 character blocks - 8x8 permits use of full screen hi-res. Secondly, in the plotting routine, the Y value is plotted direct, as any increment along this axis corresponds to an identical increment in the C.M. byte number. This reduces the calculations required in the plotting routine, and slightly increases the speed of a very slow BASIC routine.

Now we have to tackle the problems of converting horizontal C.M. bytes to vertical bytes for the printer. This is where the dreaded machine code provides the easiest answer. Included in the 6582 instruction set are instructions which permit rotation of bytes to push the end bit out of a byte into a 'carry' bit. Another instruction can then be used to take the value of this carry and push into the end of another byte (see Figure 4). Using these

instructions we can strip one bit at a time off successive C.M. bytes and build them into a vertical byte as required by the printer. Now that we have broken out in machine code, we may as well write that whole routine in machine code: the normal screen dump is slow enough in BASIC, so goodness knows how long a hi-res dump would take!

The Hprint routine

The routine has been written for maximum flexibility. Avoiding any absolute jumps within the routine means that it can be loaded into any suitably protected part of RAM by the loader provided. Suitable locations for the different configurations possible with VIC are discussed later.

The operational part of the routine starts by finding the temporary character memory start address. The number of

```
10 REM: A TYPICAL BIT MAPPING TECHNIQUE
20 FOR C=M TO 31: REM 31=NO. OF BYTES TO BE USED ON SCREEN
30 POKE 7680+C: REM 7680=SCREEN ORIGIN
40 NEXT C
```

READY.

Listing 1

```
10 REM: ALTERNATIVE METHOD OF BIT MAPPING SCREEN
20 REM: ROW=ROW COUNT (E.G. 0,10 ROWS)
30 REM: COL=COLUMN COUNT (E.G. 0,22 COLS.)
40 REM: OS=OFFSET FROM BASE
50 REM: CB=CHARACTER BLOCK
60 CB=7680: REM: SCREEN BASE
70 FOR ROW=0 TO 3: FOR COL=0 TO 21
80 OS=ROW*22+COL: REM: CALCULATE SCREEN OFFSET
90 CB=CB+OS: REM: CALCULATE ASSOCIATED CHARACTER BLOCK NUMBER
100 POKE CB+OS: CB
110 NEXT COL
120 NEXT ROW
```

READY.

Listing 2

CHARACTER TO BE PRINTED =CHR\$(N)
CHARACTER INFORMATION STARTS AT
C.H.BASE+(N#8)

SCREEN LOCATION 7680 7681

C.H.BASE+(N#8)	7680
C.H.BASE+(N#8)+1	7681
C.H.BASE+(N#8)+2	7682
C.H.BASE+(N#8)+3	7683
C.H.BASE+(N#8)+4	7684
C.H.BASE+(N#8)+5	7685
C.H.BASE+(N#8)+6	7686
C.H.BASE+(N#8)+7	7687

8 BITS

Figure 1 Construction of 4 x 8 character on screen

SCREEN.BASE	+1	+2	+3
7680	4096	4097	4098	4099
7702	4118	4119	4120	4121
7724	4140	4141	4142	4143

Figure 2 Bit mapping with manual

SCREEN.BASE	+1	+2	+3
7680	4096	4178	4256	4336
7702	4097	4177	4257	4337
7724	4098	4179	4258	4338

Figure 3 Alternative method for Mapped

	BIT NOS.							
BYTE 0	7	6	5	4	3	2	1	0
BYTE 1	7	6	5	4	3	2	1	0
BYTE 2	7	6	5	4	3	2	1	0
BYTE 3	7	6	5	4	3	2	1	0
BYTE 4	7	6	5	4	3	2	1	0
BYTE 5	7	6	5	4	3	2	1	0
BYTE 6	7	6	5	4	3	2	1	0
BYTE 7	7	6	5	4	3	2	1	0

C.H. BYTES

Figure 4 C.H. Bytes compared to printer bytes

	0	1	2	3	4	5	6	7
BIT 0	0	0	0	0	0	0	0	0
BIT 1	1	1	1	1	1	1	1	1
BIT 2	2	2	2	2	2	2	2	2
BIT 3	3	3	3	3	3	3	3	3
BIT 4	4	4	4	4	4	4	4	4
BIT 5	5	5	5	5	5	5	5	5
BIT 6	6	6	6	6	6	6	6	6
BIT 7	7	7	7	7	7	7	7	7

PRINTER BYTES

PRINTER BYTE

0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---

CARRY

0

C.H. BYTE

1	1	1	1	1	1	1	1
---	---	---	---	---	---	---	---



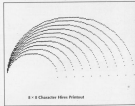
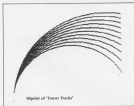
Figure 5 Transfer of bit 7 from C.H. byte to bit 0 of printer byte

```

10 PRINT "ENTER START LOCATION":INPUT L
20 READ A,B,C,D,E,F,G
30 IF A+B+C+D+E+F+G=0 THEN PRINT "DATA ERROR IN LINE"PEEK(630)+PEEK(64)+256:STOP
40 IF A=1 THEN GOTO 50
50 PRINT "DATA CHECKED & ENTERED":PORT=9700000:NEXT:PRINT "2" (NEW)
60 POKESL=A/POKESL+1,B/POKESL+2,C/POKESL+3,D/POKESL+4,E/POKESL+5,F
70 PRINT "LINE"PEEK(630)+PEEK(64)+256"OKAY"
80 SL=SL+6:GOTO 20
100 DATA 72.139,72.152,72.8, 914
110 DATA 169.4,176,168,255,32, 790
120 DATA 106,255,169,0,179,169, 940
130 DATA 32,169,255,32,192,255, 950
140 DATA 62,4,32,281,255,24, 678
150 DATA 173,5,144,41,15,281, 579
160 DATA 8,176,2,9,32,41, 260
170 DATA 29,18,18,178,282,134, 565
180 DATA 148,169,255,133,139,173, 1000
190 DATA 2,144,41,127,133,141, 588
200 DATA 173,3,144,24,41,127, 512
210 DATA 74,144,1,18,18,18, 249
220 DATA 18,133,142,133,143,169, 730
230 DATA 8,32,218,255,169,27, 781
240 DATA 32,218,255,169,16,32, 714
250 DATA 218,255,169,8,32,218, 876
260 DATA 255,169,146,32,218,255, 1867
270 DATA 24,165,143,281,7,144, 684
280 DATA 8,233,7,162,7,288, 623
290 DATA 3,178,169,0,133,143, 610
300 DATA 134,254,165,139,166,140, 938
310 DATA 164,141,133,251,134,252, 1075
320 DATA 132,253,162,0,288,193, 950
330 DATA 164,254,177,251,153,168, 1159
340 DATA 2,136,288,248,169,0, 771
350 DATA 133,255,169,0,166,254, 377
360 DATA 28,169,2,42,282,288, 644
370 DATA 49,9,128,32,218,255, 889
380 DATA 198,255,208,236,24,166, 1887
390 DATA 252,165,251,181,142,144, 1650
400 DATA 1,232,133,251,134,252, 1883
410 DATA 198,253,288,284,169,13, 1845
420 DATA 32,218,255,24,165,254, 340
430 DATA 181,139,133,139,144,2, 658
440 DATA 288,148,165,143,288,162, 1868
450 DATA 169,15,32,218,255,32, 713
460 DATA 231,255,48,184,168,184, 982
470 DATA 178,184,96,0,0,0, 378
480 DATA -1,0,0,0,0,0,-1

```

READY.



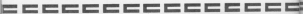
rows and columns used in the screen are also calculated, so the routine can be used with any screen format. The relevant control codes are sent to the printer at the start of each line, then groups of seven bytes are isolated, reformed into vertical bytes, and sent to the printer. Counters are used to ensure the correct number of cycles

for each block, line, and scanline. At the start of each line a check is made for the number of pixel rows required, so the last line on the screen may not contain the full seven. Opening and closing files and channels is taken care of with no file name, a file number of 4 and device number 4. Registers are saved

and restored at the respective ends of the routine.

The heart of the routine is in the sections labelled BITSHIFT and MERGE. A group of seven ones, bytes is read into a storage and work area. The last of these bytes is then subjected to an Arithmetic Shift Left, which results in the contents of bit 7 'falling off' into the carry in all

the other bits move left one place, and a zero is put into bit 0. The accumulator, previously set to zero, is then subjected to a Rotate Left operation, so that all its bits move left one place. But instead of a zero being inserted into bit 0, the contents of the carry are placed there, while the old contents of bit 7 are placed into the carry.




```

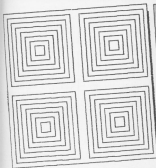
040000 PHA :
040100 TMM :
040200 PHA :
040300 TYM :
040400 PHA :
040500 PIP :
040600 DRA#04 OPEN : SET FILE NUMBER
040700 TMM : SET DEVICE NUMBER
040800 DY#FF : OFF=NO SECONDARY ADDRESS
040900 DRA#FF : SET LOGICAL FIRST/SECONDARY ADDRESSES
041000 DRA#00 : FILE NAME,OFF=NO NAME
041100 TMM : NO ADDRESS FOR NAME
041200 TMM :
041300 DRA#FF00 : SET FILE NAME INFORMATION
041400 DRA#FFC0 : OPEN LOGICAL FILE
041500 DRA#04 : SELECT OUTPUT CHANNEL
041600 DRA#FC : OPEN OUTPUT CHANNEL
041700 CLC : FIND SCREEN FORMAT & CHAR.MEM.LOCATION
SCREENFO: : TO FIND C.R.ADDR. HI BYTE
041800 DRA#00 :
041900 DRA#00 :
042000 DRA#00 :
042100 DRA#00 : IT'S IN RAM
042200 DRA#00 : IT'S IN RAM
042300 RSL :
042400 RSL :
042500 TMM :
042600 CLC : ADDRESS SET #01 BELOW ACTUAL VALUE
042700 DRA#0C : TO SIMPLIFY USE OF INDEX IN COUNTING
042800 DRA#FF : POINTERS SET,HIGH BYTE IN #0C
042900 DRA#00 : LD BYTE IN #00
043000 DRA#00 : TO FIND NUMBER OF COLUMNS
043100 DRA#FF :
043200 DRA#FF : SET REFERENCE COUNTER
043300 DRA#00 : TO FIND NO.SCREEN ROWS & CHAR.SIZE
043400 CLC :
043500 DRA#FF : IF CHARACTERS #016 THEN BIT 0=1
043600 SR : BIT 0 SHIFTED INTO CARRY
043700 SCC#0440 : #00 CHARACTERS
043800 RSL : MULTIPLY BY 16
043900 RSL : OR 0
044000 RSL : TO CALCULATE TOTAL NUMBER
044100 RSL : OF PIXEL ROWS PER SCREEN COLUMN
044200 TR#0E : SET REFERENCE COUNTER
044300 TRA#0F : SET COUNTER FOR PIXEL ROWS LEFT IN COL.
LINESTAR: : PRINTER INSTRUCTIONS G=GRAPHIC MODE
044400 DRA#00 : OUTPUT CHARACTER TO CHANNEL
044500 DRA#10 : WARNING CODE FOR PRINT START POSITION
044600 DRA#FF :
044700 DRA#10 : FIRST DIGIT OF START POSITION
044800 DRA#FF :
044900 DRA#00 : SECOND DIGIT
045000 DRA#00 :
045100 DRA#FF : REVERSE OFF=USE #12 FOR REVERSE FIELD ON
045200 DRA#FF :
045300 DRA#00 :
045400 CLC : LINEINFO: SET UP COUNTERS FOR THIS LINE
045500 DRA#0F : NO.PIXEL ROWS LEFT TO PRINT IN THIS COL.
045600 DRA#0F : ENOUGH FOR FULL BLOCK?
045700 SCC#0470 : NO - GO TO SHORT BLOCK
045800 SC#007 : REDUCE COUNTER FOR ROWS LEFT
FULLBLK: : SEVEN ROWS THIS LINE
045900 DRA#0F :

```

```

04710000 SHEP0476      : BRANCH TO COUNTSET
04730000 TRK           SHORTBLK: NO. ROWS THIS LINE
04750000 STW#000       LAST LINE-MORE LEFT TO PRINT
04760000 STW#00F       COUNTSET: SET ROWS LEFT
04780000 STW#00F       : SET ROWS THIS LINE
04790000 STW#000       : SET LINE START ADDRESS
047C0000 LK#0FC        :
047E0000 LK#0FD        : GET NO. COLUMNS IN LINE
04800000 STW#00F       : SET ADDRESS LO BYTE
04820000 STW#0FC       : SET ADDRESS HI BYTE
04840000 STY#0FD       : SET COLUMN COUNTER
04860000 LK#000        MAKE SURE NO BRANCH
04880000 SHEP0440      STAGE   : STEP IN BRANCH FROM 'NEXTLINE'
048A0000 LK#00F       BLKSTART: SET INDEX TO NO. ROWS THIS LINE
048C0000 BK#0F00.Y     BLKSTORE: GET ONE C.A. BYTE
048E0000 STW#00200.Y   : SAVE IN WORK AREA
04910000 DEY           : DECREMENT INDEX
04930000 SHEP040C      : IF ANY LEFT GO BACK TO BLKSTORE
04940000 STW#000       BITSTRIP: 8 BITS PER C.A. BYTE
04960000 STW#00F       : SET BIT COUNTER
04980000 STW#000       : CLEAR ACCUMULATOR FOR NEW PRINTER BYTE
049A0000 LK#00F       : SET INDEX TO NO. ROWS THIS LINE
049C0000 STW#00200.X   STRIPIT : STRIP NEXT BIT OFF THIS BYTE INTO CARRY
049F0000 RCL           : MOVE CARRY INTO ACCUMULATOR
04A00000 DECX          : ADJUST INDEX FOR NEXT BYTE
04A10000 SHEP040C      : IF ANY LEFT THEN STRIPIT
04A30000 CRR#000       BYTEND  : PRINTER BYTE ASSEMBLED - SET BIT 7
04A50000 STW#00FF0     : OUTPUT TO PRINTER
04A70000 DECX          : DECREMENT BIT COUNTER
04A90000 SHEP0400      : IF ANY LEFT THEN GO BACK FOR NEXT
04AC0000 LK#000       BLOCKEND: PREPARE FOR NEXT BLOCK
04AD0000 LK#0FC       : GET START ADDRESS OF CURRENT BLOCK
04AF0000 STW#00F       :
04B10000 STW#00C00     : RID NO. ROWS PER COLUMN
04B30000 STW#00C0400   : TO FIND START ADDRESS OF NEXT BLOCK
04B50000 HL           :
04B70000 STW#00F       : SET ADDRESS POINTERS
04B90000 STW#0FC       :
04BB0000 STW#00C0FD    : DECREMENT COLUMN COUNTER
04BD0000 SHEP040A      NEXTBLK : IF ANY LEFT GO BACK TO BLKSTART
04BE0000 LK#000       ENDLINE  : ALL DONE-SEND CARRIAGE RETURN
04C00000 STW#00FF00    :
04C30000 LK#000       NEWLINEP: CALCULATE START ADDRESS OF NEXT LINE
04C40000 STW#00F       : SET NO. PIXEL ROWS THIS LINE
04C60000 STW#00C00     : RID TO LD BYTE OF CURRENT START ADDRESS
04C80000 STW#000       : SET LD BYTE OF NEW ADDRESS
04CA0000 STW#00C0000   :
04CC0000 INCX          : IF NECESSARY INCREMENT HI BYTE
04CE0000 STW#00F       : CHECK FOR ROWS LEFT
04D00000 SHEP0400      NEXTLINE: IF ANY LEFT BRKTHROUGH STAGE TO LINSTART
04D20000 STW#00F       OUT     : NONE LEFT - RESTORE PRINTER TO TEXT MODE
04D40000 STW#00FF00    :
04D70000 STW#00FF00    : CLOSE FILES & CHANNELS
04D90000 PUP           : RESTORE REGISTERS
04DB0000 PLA           :
04DD0000 TRV           :
04DE0000 PLA           :
04DF0000 TRK          :
04E10000 PLA           :
04E30000 RTS           : BACK TO BASIC

```



setting it to zero.

This illustrates the difference between MATH and ROTATE operations. Each byte in the storage area has its bit 7 stripped off in this way until the accumulator contains all the bit 7's, i.e., a vertical byte. This byte is sent to the printer, and the process repeated for bits 6, 5, and so on until all the seven bytes have been completely stripped. The next block of bytes read into the work area, and the process starts again.

Each byte sent to the printer sets a column of needles in the print head. Bit 6 sets the top needle, bit 5 sets the next one down, and so on down to bit 0 (not printed, but must be set to logical 0). Loading the accumulator with zero at the start of each byte assembly simply prevents any stray values appearing in the printer.

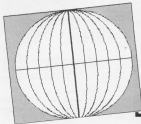
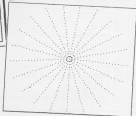
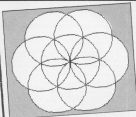
These counters are all in zero page. \$08-\$0F are in the RND function work area and \$0A-\$0F are free locations.

The assembly language listing explains the detailed operation step by step, but one instruction requires further explanation. RND \$0400 to \$0400 is an indent to allow a branch back to line start, which could be out of range for a direct branch from \$0400. The alternative is an absolute jump, which would restrict the positional flexibility of the routine.

Hires 1

This is a fully documented program using double-height characters; bit mapping in such a way as to permit use of the Hi-Print routine. This program will run happily in a Vic with 4K or more expansion.

The screen format is 32 columns of 18 rows, giving 288



Counter locations used

Reference

\$08 C.M. Address LO
\$0C C.M. Address HI
\$0E/M Screen columns
\$0F Total no. pixel rows on screen
\$0F No. pixel rows left to print

Working

\$08 C.M. Address LO
\$0C C.M. Address HI
\$0D Column counter
\$0F Pixel rows in current line
\$0F Bit counter for shifting

```

5 REM
10 :
20 REM FULL SCREEN HIGH RESOLUTION USING DOUBLE HEIGHT CHARACTERS
30 :
40 PRINT "F REM CLEAR SCREEN
50 :
60 REM INITIALISE
70 :
80 PEEKS=844:PEEK(36845)OR 128:REM COLOUR MAP TO 36845
90 PEEK 36845:320:REM CHA:REM. AT 4096:SCREEN AT 7680
100 PEEK 36847:140:REM 10 ROWS,8000 CHARACTERS
110 PEEK 36849:0:REM SCREEN & BORDER BLACK
120 :
130 REM SET-UP SCREEN
140 :
150 REM ROW-ROW COUNT (10 ROWS)
160 REM CL=COLUMN COUNT (32 COLS.)
170 REM CH=OFF-SET FROM BASE
180 REM CH=CHARACTER BLOCK
190 REM ROW-ROW & ROW-SCREEN BYTE
200 PEEK 648:70:REM TELL OF SYSTEM WHERE SCREEN IS
210 CH=3768+444:PEEK(36846)+65536:REM START OF COLOUR MEMORY
220 CH=848:REM CH=848:REM START
230 FOR ROW=0 TO 9:FOR CL=0 TO 31
240 CH=ROW*32+CL:REM CALCULATE SCREEN OFFSET
250 CH=CL*10+0:REM CALCULATE ASSOCIATED CHARACTER BLOCK NUMBER
260 PEEK 50+CH:0
270 PEEK CH+25:7:REM SET PIXEL COLOUR.
280 NEXT CL
290 NEXT ROW
300 :
310 REM CLEAR CHARACTER MEMORY
320 :
330 FOR I=0 TO 3200:REM SIZE OF C.M.(160*20*10)
340 PEEK CH+I:0
350 NEXT I
360 DOUBLE 3168:REM POWERS OF TWO
370 :
380 REM USER PROGRAM
390 :
400 REM SAMPLE PROGRAM "TRACE TENDIS"
410 :
420 I=0:J=0
430 FOR I=0 TO 10:J=0
440 FOR X=0 TO 175
450 J=J+2:500+X*2:IF J>175 THEN X=175:GO TO 430
460 X=X+2:J=0
470 I=I+1
480 DOUBLE 5000:REM CHECK/PLUT
490 NEXT X:NEXT I
500 SET 80:IF 80=""THEN 500
510 GOSUB 3824:REM HPRINT
520 END
5300 :
5400 REM CHECK VALUES IN RANGE
5500 :
5600 IF FOR THEN J=0
5700 IF 50175 THEN X=175
5800 IF FOR THEN X=0
5900 IF 50155 THEN J=155
6000 :
6100 REM PLUT
6200 :
6300 COUNT=0:REM WHICH COLUMN
6400 REM Y VALUE = ROW NUMBER
6500 IF CH+CH=CH:REM WHICH CHARACTER BYTE
6600 B1=0 AND 7:REM WHICH BIT
6700 PEEK 54+PEEK(30) ON PEEK(51):REM TURN ON SINGLE PIXEL
6800 RETURN
6900 :
7000 REM PREPARE POWERS OF TWO ARRAY
7100 :
7200 REM POW(2) REM DECLARE POWERS OF TWO ARRAY
7300 REM I=0 TO 7
7400 PEEK(51)=2+175-51:REM EACH BIT HAS CORRESPONDING POWER OF TWO
7500 NEXT I
7600 RETURN

```

REPLY.

Line 1

screen bytes. As it uses double height characters, a character memory of 100 (100 × 10) bytes is required. This when added to 500 bytes for screen memory uses up more space than desirable in the unexpanded VIC, as there would not be any room for a program! Therefore, a minimum of 1K expansion is essential. With just 1K expansion the pointers to top of memory should be set to Page 15, to protect the character memory, which starts at 4096, with the screen start at 7680. But, if the Hi-Print routine is to be used, it is kept between Pages 15 & 16, so set top of memory to Page 15 with:

POKE 54,15 : POKE 52,15 : CH

before loading anything. Hi-Print can then be located starting at 5840.

If using more than 1K expansion (i.e. main RAM above screen), it is necessary to raise the bottom of memory to Page 12 before loading anything, in order to leave room for the C.M. and screen below the program. This is done with

POKE 40,17 : POKE 8700,0 : NEW

The NEW is needed to reset all BASIC pointers to the new configuration. In this situation the Hi-Print routine can very conveniently be loaded anywhere between 1024 and 4096, in the program printed. SYS 1024 calls the routine loaded at the bottom of this area. This address can easily be changed by altering the target address in the accompanying loader program.

Neither this program nor the one for the unexpanded VIC are anything spectacular; they are merely demonstrations of technique. They are however sequenced so that bit-mapping and clearing the screen can be observed.

Hires 3

This is a highly condensed and slightly modified version of Hires 1, written to run on the basic VIC. The screen format is reduced to 10 rows × 22 columns and uses 8 × 8 character. Values used in initialization and

blu-mapping are obviously different, but the techniques are the same.

Character memory is located at 5120 up, leaving just 16 for the program and Hilight routines. As the character memory requires $10 \times 128 = 1280$ bytes, the c.m. ends at 4840, leaving a large enough gap between it and the screen start at 7680 for the Hilight routine — as long as we are careful not to use any of these locations, accidentally when plotting onto the c.m.

A good starting address for the routine in this case would be at the beginning of Page 28 i.e. 7424. In fact this would permit a few more lines to be used for the hi-res screen.

If using the accompanying loader, it is necessary to set the top of memory pointer in Page 28 to

POKE 54,29 : POKE 52,29 : CB

The loader is then used to locate the routine, and then

the pointers must be reset to Page 28 by the same method.

In both programs, the X range is 0 to 2559, columns, while the Y (vertical) range is from 0 to 1023, lines in Program 2, and 0 to 1023, lines in Program 1.

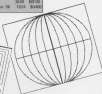
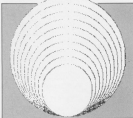
Basic loader

The loader requests a start location for the Hilight routine. It then performs a checksum for each set of six data values, confirming each line. If an error is detected, the program stops and the offending line number is displayed. After running successfully the program HILTS itself, leaving the routine table placed in the desired position.

Suggested Start Addresses

Unexpanded VIC	7424	81000
VIC + 32	3248	80700
VIC + more than 32	1824	80400

These addresses are used in the SYS call to activate the Hilight routine.



```

66 PRINT "I": POKE36869,253: POKE36867,28: POKE36879,8
190 SB=7680: CH=38400: CH=5120
230 FORRO=8T09: FOR CL=8T021: OS=RO*22+CL: CB=CL*18+50
260 POKESB+OS, CB: POKECH+OS, 7: NEXTCL: NEXTRO
330 FOR I=0 TO 1768: POKECH+1,0: NEXT
430 B=00: FORT=1T018: B=B-5: FORK=8T0175: J=B*2,8W=X*W: IF J<8THENX=175: 8T0438
460 K=80R(J): Y=79-K: 80SJB8888
490 NEXTX: NEXTT
580 DETR=1: IPRB=""THEN888
510 SYS7424: END
5880 IFX<8THENX=0
5940 IFX<175THENX=175
5880 IFY<8THENY=0
5960 IFY<79THENY=79
5180 C=INT(K/8): IV=CH+Y+(C*88): B1=WRND7: POKEBY, C2+(7-B1): ORPEEK(BY): RETURN

```

READY.

Screen 2

In this month's
project, Gary
Marshall shows you
how to create a
program using
animated effects.

PROGRAMMING PROJECTS

PROGRAMS THAT DEPEND on mobile graphics for their fascination and attraction range from games to the better educational programs. Moving graphics are a key feature of all the games of the Space Invaders type that have developed through Pacman to today's sophisticated products. The most notable instance in education where the allure of animation has been used to good effect is Logo. A Logo microworld full of moving shapes is a perfect test-bed for learning about the laws of motion, gravity and many other topics.

The solution

The kit can maintain up to eight sprites, and we want each to move around on the screen in its own way. By writing a subroutine for moving each sprite we can write a main program that calls each subroutine in turn. Then the program can continually cycle round the eight subroutines to keep the eight sprites moving. Remembering that the sprites are numbered from 0 to 7, this will give us the basis of our program as in Listing 1.

Here, the loop variable, K, ranges through the sprite numbers. The next line calls the subroutine starting at line 100 where K is 0 to move sprite 0, the subroutine starting at line 1000 where K is 1 to move sprite 1, and so on. When all eight sprites have been moved, line 270 sends the computer back to the beginning of the loop to do it all again.

There is a neater way of doing this. If we were the line numbers at the start of the subroutines for moving sprites 0 to 7 in ascending order, an array named say, M, we can enter Listing 1.

(Unfortunately, this doesn't work on my 6502-based Apple

```
240 FOR K=0 TO 7
250 ON K+1 GOSUB 500, 1000, 1500, 2000, 2500, 3000, 3500,
4000
260 NEXT K
270 GOTO 240
```

Listing 1

```
240 FOR K=1 TO 7
250 GOSUB M(K)
260 NEXT K
270 GOTO 240
```

Listing 2

statements from the manual and any number of handbooks that it should.

Having started, in the middle of the program, we must now work our way backwards. We shall begin by going towards the beginning of the program to create the sprites and put them in their

```
10 DIM M(7), C(7), R(7)
20 FOR K=0 TO 7
30 M(K)=R+P
40 READ C(K), R(K)
50 NEXT K
60 DATA 60, 60, 140, 40
70 DATA 220, 60, 220, 140
80 DATA 220, 220, 140, 220
90 DATA 60, 220, 60, 140
```

Listing 3

```
100 PRINT "0"
120 FOR S=0 TO 60 STEP 3
130 POKE 832+K, 1: POKE 832+K+1, 1: POKE 832+K+2, 0
140 IF S=18 THEN POKE 832+K, 255: POKE 832+K+1, 255: POKE
832+K+2, 255
150 IF S=39 THEN POKE 832+K, 255: POKE 832+K+1, 255: POKE
832+K+2, 255
160 NEXT K
```

Listing 4

initial positions. Then we can complete the program by writing the subroutines for moving the sprites.

The eight sprites will each have their own colour and, when they are first displayed, a position. Each position can be fixed by giving a column and a row. To represent the colours and positions we can use three parallel arrays, as shown in figure 1. The arrays B, C and E will hold, respectively, the first, column and row for sprite 0 will be held in element 0 of the relevant array.

To give the sprites their initial positions shown in figure 2, we start the program with Listing 3.

After this, we make the program clear the screen and, leaving a gap in the line numbering to fill later with initialisation for the subroutines, we start a sprite description to be shared by all the sprites. We have described the mechanics of sprite descriptions in an earlier project, and using the same description for a fish-shaped sprite that we used before given in listing 4.

Now, with the sprite description stored, we can associate it with all eight sprites by making the eight locations starting at the one with address 260 point to it. We give the sprites their colours by copying the colour codes from the array H to the block starting at \$220 and, similarly, give them their initial positions by transferring the column and row numbers from the arrays C and E to the block from \$240 to \$259. This is done by listing 5.

```
170 FOR J=0 TO 7
180 POKE 264+J, 15
190 POKE 26276+J, 0:J1
200 POKE 26248+2+J, 0:J2
210 POKE 26249+2+J, 0:J2
220 NEXT J
```

Listing 5

Even now, the sprites won't appear, because we must turn them on. This can be done for all the sprites with:

```
230 POKE 53289, 255
```

Running the part of the program consisting of lines 10



Figure 1. The parallel arrays used to initialize the sprites

```
110 Y5=10: X5=5: T=0: A=0
1600 Y=PEEK(53250)
1610 Y=Y+Y5
1620 POKE 53251, Y
1630 IF Y>220 OR Y<0 THEN Y5=-Y5
1640 RETURN
```

Listing 6

```
2000 X=PEEK(53254)
2010 X=X+X5
2020 POKE 53254, X
2030 IF X>220 OR X<0 THEN X5=-X5
2040 RETURN
```

Listing 7

```
4000 T=T+T/50
4010 IF T=255 THEN T=0
4020 X7=140+80+COS(T): Y7=140+80+SIN(T)
4030 POKE 53262, X7: POKE 53263, Y7
4040 RETURN
```

Listing 8

```
3600 A=PI/25
4010 IF A=255 THEN A=0
4020 X5=140+40*SIN(A): Y5=140+40*COS(A)
4030 POKE 53256, X5: POKE 53257, Y5
4040 RETURN
```

Listing 9

to 230 will show the eight coloured sprites in their initial positions. If you include lines 240 to 270, though, you will get an error message, for we haven't got round to writing the subroutines which they call yet. If you want to test the whole thing up to line 270, you can include 'dummy' subroutines that do absolutely nothing except establish that the structure of the program is right by adding a series of lines such as:

```
300 RETURN
700 RETURN
and so on up to
4000 RETURN
```

Now we shall better replace these empty subroutines with routines that will actually move the sprites. We shall not write all eight, but just those for the odd-numbered sprites to make them move along the paths that are indicated in figure 2.

Sprite number 1 is to move up and down along a vertical path, bouncing off imaginary barriers at each end. This means that it stays in the same column all the time, so we need not change that.

Its row must keep changing, though. If we store the amount by which it changes under Y5 and initialise Y5 in line 110, along with other variables for the other subroutines, then the subroutine must take the row position of sprite 1 from location 53251, add the contents of Y5 to it, and put the new value back. This will automatically move the sprite to the new position.

The only other thing that we need to do is to test whether the sprite has reached the 'wall' at one end or the other and, if it has, to change the sign of the number stored in Y5 to make the sprite bounce back. Since the subroutine for sprite 1 starts at line 1600, this gives us listing 6.

The subroutine for sprite 3 follows the same lines, see listing 7.

The path for sprite 5 is a circle centred at (140,140) with radius 40. This means that for any value of an angle T the point (140+40cos(T), 140+40sin(T)) is on this circle, and as the value of T increases the corresponding point moves

anti-clockwise around the circle. Also, T0 will give the initial position of sprite 7, so, with I initialized to the line 110, we can move sprite 7 round its circular path with Listing 8.

Although the path of sprite 5 is an elliptical one, the sprite can be moved along it in much the same way by Listing 9.

It is left to you to write subroutines to move the even-numbered sprites. The listing of the program as far as we have developed it is given in Program 1.

Moving on

At this stage, we can take development a little further by naming off the even-numbered sprites, since there is as yet no way to move them, and use the 414 sprite collision detection to turn them on again. This will illustrate how the collision detection works, and in so doing will provide the basis on which some spectacular effects can be built. For instance, it can be elaborated so that when two sprites collide one of them is wiped out or, perhaps, a new one is born.

At the start of the program, we can use another array, Q, parallel to the arrays for the hue, column and row, to record which sprites are initially on and which off. In element 8, records that sprite 8 is on by containing a 1 and that it is off by holding a 0. The array can be declared, initialised to show that only the odd-numbered sprites are on, and then used to turn just those sprites on with the amendments and insertions in Listing 10.

We can then use the array Q to ensure that the program only bothers to try to move sprites that are on by adding the following line to the central movement monitoring section of the program.

```
245 IF Q(I)=0 THEN 288
```

Now, the sprite collisions are recorded in location 53279. What happens, for example, is that when sprites 3 and 5 collide, bits 3 and 5 in this location are set. It is also important to remember that the act of PEEKing at this

Program Listing 1

```

30 BIR H(75), C(75), R(75)
35 FOR K=0 TO 7
36 H(K)=40*Y
40 PERC C(0), R(0)
50 NEXT K
60 BIR 68,69,148,68
70 BIR 228,68,228,148
80 BIR 228,228,148,228
90 BIR 68,228,68,148
100 POINT "I"
110 V0=10: W0=50: T0=0: B=0
120 FOR K=0 TO 68 STEP 3
130 POKE 532+K, 1: POKE 532+K+1, 1: POKE 532+K+2, 0
140 IF K=18 THEN POKE 532+K, 228: POKE 532+K+1, 228: POKE 532+K+2, 228
150 IF K=30 THEN POKE 532+K, 228: POKE 532+K+1, 228: POKE 532+K+2, 228
160 NEXT K
170 FOR J=0 TO 7
180 POINT 5348+J, 13
190 POKE 53287+J, H(J)
200 POKE 53248+24J, C(J)
210 POKE 53249+24J, R(J)
220 NEXT J
230 POKE 53268, 228
240 FOR B=0 TO 7
250 ON K+1 GOSUB 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000
260 NEXT K
270 GOTO 340
280 RETURN
1000 W=PEEK(53251)
1010 V=V*V
1020 POKE 53251, V
1030 IF V>228 OR V<68 THEN V=V-68
1040 RETURN
1500 RETURN
2000 W=PEEK(53254)
2010 W=W*W
2020 POKE 53254, W
2030 IF W<228 OR W>68 THEN W=W-68
2040 RETURN
2500 RETURN
3000 W=4+V/25
3010 IF W=244 THEN W=0
3020 W=(148-40*W)*W: V=(148+68*W)*W
3030 POKE 53258, W: POKE 53259, V
3040 RETURN
3500 RETURN
4000 T=T+V/50
4010 IF T=244 THEN T=0
4020 X=(148-68*W*W): Y=(148+68*W*W)
4030 POKE 53260, X: POKE 53261, Y
4040 RETURN

```

```
254 Z1=PEEK(53279)
```

```
256 IF Z1<>0 AND Z1<>2 THEN GOSUB 5000
```

```
258 Z=Z1
```

Listing 12


```

10 DIM H(7), G(7), R(7), Q(7)
15 P=0
45 G(K)=R-2+INT(R/2)
46 IF G(K)<0 THEN P=P+2*H
230 POKE 5326P, P

```

Listing 11

```

3000 S=0
3010 FOR L=0 TO P
3020 IF S=L THEN S=L+1-S
3030 NEXT L
3040 IF S=0 THEN RETURN
3050 GOSUB 5000: POKE 5326P, PEEK(5326P) OR 2*H
3060 RETURN

```

Listing 11

location clears it, since all we want to do at the moment is to use any collision to trigger the turning on of another sprite, we could add the line,

```

215 IF PEEK(5326)=0 THEN
GOSUB 5000

```

This will test and clear the location that records the collisions after each individual sprite movement, calling a subroutine to turn on another sprite if a collision has just occurred. All the subroutine has to do is to scan the array Q to find a sprite that is off, and then update Q and turn the sprite on. This can be done by Listing 11.

Actually, the way that the subroutine is triggered is not entirely satisfactory. This is because once two sprites meet they can stay in contact for some time. Although the collision is recorded when

they first meet, the act of PEEKing the collision register clears it, and if the sprites are still in contact the next time around, the collision is recorded again. For this reason, the meeting of one pair of sprites can be recorded several times as a collision and, correspondingly, will turn on several sprites. This is not exactly what we wanted. To avoid it, we must replace line 225, using a more stringent test. In effect, we must say "has a collision occurred, and is it a different collision from the last one?". We can do this by adding,

```

235 D=PEEK(5326)

```

to clear the collision register is the first place. Then we should replace line 261 with Listing 12. The complete program is listed in Program 2.

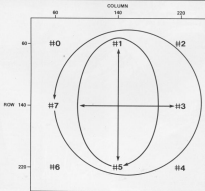


Figure 3. Initial positions and paths for the sprites.

Program Listing 2

```

10 DIM A(7), C(7), K(7), S(7)
15 P=0
20 FOR S=0 TO 7
30 GOTO 40
40 READ C(S), R(S)
45 S1=40-24*INT(S/2)
46 IF S<0 OR S=24 THEN P=P+24
50 NEXT S
48 DATA 68,60,148,60
70 DATA 228,60,228,148
88 DATA 228,228,148,228
90 DATA 68,228,68,148
100 PRINT "P"
120 V=68: W=60: T=0: A=0
130 FOR S=0 TO 68 STEP 2
135 P=PEEK(S*2), L: P=PEEK(S*2+1), H: P=PEEK(S*2+2), B
140 IF A=S THEN P=PEEK(S*2), 228: P=PEEK(S*2+1), 228: P=PEEK(S*2+2), 228
150 IF W=24 THEN P=PEEK(S*2), 180: P=PEEK(S*2+1), 228: P=PEEK(S*2+2), 228
160 NEXT S
170 FOR S=0 TO 7
180 P=PEEK(W*2), L
190 P=PEEK(W*2+1), H
200 P=PEEK(W*2+2), C(L)
210 P=PEEK(W*2+3), C(H)
220 NEXT S
230 P=PEEK(S*2), F
235 I=PEEK(S*2+1)
240 FOR S=0 TO 7
245 IF S<0 OR S=24
250 OR S=40: GOTO 255: S=1500: 1500, 1500, 1500, 1500, 1500, 1500, 1500, 1500
255 I=PEEK(S*2)
260 IF 210<S AND 210<2 THEN GOTO 3000
270 L=0
280 NEXT S
290 GOTO 240
300 RETURN
3000 I=PEEK(S*2)
3010 W=W+1
3020 FOR S1=0 TO 14
3030 IF W<20 OR W=24 THEN S=S+20
3040 RETURN
3050 RETURN
3060 RETURN
3070 IF S<0 OR S=24 THEN S=0
3080 S=S+40+40*INT(S/40): S=(40+40*INT(S/40))
3090 P=PEEK(S*2), H: P=PEEK(S*2), H
3100 RETURN
3200 S=0
3300 FOR L=0 TO 7
3350 IF S<0 OR S=24 THEN S=L: S=0
3400 NEXT L
3410 IF S=0 THEN RETURN
3420 S=S+40: P=PEEK(S*2), P=PEEK(S*2+1): S=S
3430 RETURN
3435

```

Further developments

There are obviously plenty of ways to take these ideas and build them into all sorts of programs. The immediate extensions and improvements that can be made include the following.

- New subroutines for moving the sprites can be introduced. The paths that they can follow are unlimited, but the introduction of a random element can give interesting effects, as can the use of a path that depends on the positions of the other sprites.



- A larger part of the screen can be used for movement. To store column positions in memory of 255 requires more than one eight-bit location, and it is possible to use location 50064 to hold one extra bit for the column position of each of the eight sprites.
- All sorts of effects can be created by making sprites vanish and disappear on particular cues. If all eight sprites are turned on the program should be prevented from calling the sub-routine to try and turn on another. First, because it can't and, second, because it slows the program down.
- Sprites of different shapes, sizes and colours can be used. Perhaps a sprite could be transformed to another shape when it collides with another one.

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tackle the problem of using
machine code to sort string
arrays into order.

SORTING STRINGS IS MORE DIFFICULT than sorting numbers because of the manner in which the BASIC interpreter stores strings. But, it is no good writing, or even attempting to write, a machine code string sort until the storage mechanism is thoroughly understood.

String descriptors

Strings are controlled by string descriptors which consist of three bytes as shown in Figure 18.1. The first byte holds the string length and refers to the number of bytes occupied by the string which, of course, is the same as twice the number of characters in the string. This does not vary the number of characters BASIC allows in one string is restricted to 255. The highest number possible in any byte, including the string length byte, is 255. The other two bytes in the string descriptor give the string address (in the form of low-byte, high-byte) where the strings are stored. They are merely address pointers, not the strings themselves. The actual string, consisting of the equivalent ASCII codes, is stored in sequential memory locations, starting at the address given by the address pointer in the string descriptor.



Figure 18.1 Keeping strings under control

MASTERING MACHINE CODE

Thus, in the part of a sort routine where two strings have to be swapped (because they happen to be in the wrong order), we swap over the descriptors rather than the strings themselves. When sorting, then, it is only necessary to ensure that the string descriptors are in order. The strings themselves can be left in exactly the same haphazard order they were in before the sort process began. This will clearly reduce the execution time of the sort. In effect, we are tricking the BASIC interpreter by rearranging its string array access table (a collection of string descriptors).

How string arrays are stored

A string array is a collection of separate strings, sheltering under a common name. We would therefore expect the format for handling string arrays to be more complicated than single strings because it must cater, not only for the array name, but also for the number of dimensions in the array together with the array size. However, string arrays are handled in a similar way to integer arrays. See Figure 18.2.

Bytes 1 and 2

These are reserved for the array name. In order for the interpreter to

array name. In order for the interpreter to distinguish string arrays from integer or floating point arrays, the first byte is the ASCII code of the first character of the array name. (You will remember from last month's discussion, that the first byte in the integer array format is the ASCII code + \$80.) The second byte is either the second character of the array name + \$80 or, if there isn't one, just \$80. As an example, B5 would have \$42 (the ASCII code for B) in the first byte and \$85 alone in the second byte. On the other hand, if the array name was BC5, the second byte would be the sum of the ASCII code for (\$42) and the constant \$85, making a total of \$C7.

Bytes 3 and 4

These are address pointers to the next array arranged in the order low byte, high byte.

Byte 5

The number of dimensions in the array, obviously limited to 255.

Bytes 6 and 7

The array size, in high-byte, low byte order for a change. The three-byte string information blocks then follow on after the heading information.



Figure 18.2 Handling string arrays

```

10 BUBBLE SORT
20 :OF A STRING ARRAY
30 NUMBER = #FB
40 COUNT = #FD
50 ONE = #57
60 TWO = #59
70 FLAG = #FF
80 STRING1 = #58
90 STRING2 = #5D
100 LENGTH1 = #5F
110 LENGTH2 = #60
120 **#C000
130 SEC
140 LDA NUMBER
150 BSC #1
160 STA NUMBER
170 BCS LOOP1
180 DEC NUMBER+1
190 LOOP1
190 CLC
200 LDA #2F
210 ASC #FOA
220 STA TWO
230 LDA #30
240 ADC #0
250 STA TWO+1
260 LDA #0
270 STA FLAG
280 STA COUNT
290 STA COUNT+1
300 LOOP2
310 LDA TWO+1
320 STA ONE+1
330 LDA TWO
340 STA ONE
350 CLC
360 ADC #3
370 STA TWO
380 BCC SKIP
390 INC TWO+1
400 LDY #0
410 LDA (ONE),Y
420 STA LENGTH1
430 LDA (TWO),Y
440 STA LENGTH2
450 INY
460 LDA (ONE),Y
470 STA STRING1
480 LDA (TWO),Y
490 STA STRING2
500 INY

```

```

500 LDA (ONE),Y
510 STA STRING1+1
520 LDA (TWO),Y
530 STA STRING2+1
540 LDY #0
550 LOOP3
560 LDA (STRING2),Y
570 CMP (STRING1),Y
580 BCC SWOP
590 BNE NOSWOP
600 INY
610 COPY LENGTH1
620 DEC NOSWOP
630 COPY LENGTH2
640 DEC SWOP
650 BNE LOOP3
660 BNE LOOP1
670 LDY #2
680 STY FLAG
690 LDA (ONE),Y
700 TAX
710 LDA (TWO),Y
720 STA (ONE),Y
730 TAX
740 STA (TWO),Y
750 DEY
760 BPL LOOP4
770 NOSWOP
780 INC COUNT
790 BNE SKIP2
800 INC COUNT+1
810 LDA COUNT
820 CMP NUMBER
830 BNE LOOP2
840 LDA COUNT+1
850 CMP NUMBER+1
860 BNE LOOP2
870 LDA FLAG
880 BEQ FLAGCLEAR
890 LDA NUMBER
900 SEC
910 BSC #1
920 STA NUMBER
930 BCS SKIP3
940 DEC NUMBER+1
950 LDA NUMBER
960 BNE STAGE
970 FLAGCLEAR RTS

```

READY.



Program 10.1: Routine to test machine code

```

10 REM TESTING THE MACHINE CODE
20 REM STRING SORTING ROUTINE
30 PRINT#99:(147):INPUT"ENTER NUMBER OF
STRING:"
40 REM FILL AND DISPLAY ARRAY
50 DIM A$(100)
60 FOR N=1 TO 95
70 B$=""
80 A$(N)=CHR$(INT(1)+1)
90 FOR J=1 TO 45
100 K$=26+RND(1)
110 B$=CHR$(K$+65)
120 B$=B$+B$
130 NEXT J
140 A$(N)=B$
150 PRINT A$(N)
160 NEXT N
170 PRINT:PRINT
180 PRINT"SORTING"
190 PRINT:PRINT
200 REM PREPARE CALL PARAMETER
210 H$="01/256"
220 L$="001"
230 REM PASS PARAMETER
240 POKE 251,L$
250 POKE 252,H$
260 T1$="0000000"
270 REM CALL MACHINE CODE ROUTINE
280 SYS 49152
290 T2$=T1$+60+0.5
300 REM DISPLAY SORTED STRING ARRAY
310 FOR N=1 TO 95
320 PRINT A$(N)
330 NEXT N
340 PRINT
350 PRINT B$"STRING$ SORTED IN" T2$"SECONDS"

```

READY.

Armed with this information as the scope of string arrays, we can now turn to the study of Program 10.1.

Bubble sort string array

The homely, and sometimes despised, algorithm known as the bubble sort is again used. In BASIC it is horribly sluggish but in machine code it is quite acceptable and has the advantage of using little memory. Comparison with the integer version, Program 8.1, given in last month's issue, shows that they both have a good deal in common. Not every one will have an assembler for entering Program 10.1 directly because it is in source-code to the equivalent machine code bytes (the object code) as given in the form of a hex dump shown as Program 10.1A.

To enter the machine code bytes, they need to be FORKed individually, starting with the first byte at address 49152. However,

remember that the Commodore 64 does not recognise hex bytes which means that you would have the boring task of converting them all to decimal first – and without making one single error! Fear not. Type in Program 10.1A which accepts data written in hex.

Once you have entered the code, you won't know whether you have entered everything correctly or, indeed, whether the program works at all. This is where Program 10.2 comes in handy. Assuming the machine code bytes are already in a block of memory starting at decimal address 49152, this program will call on the machine code and try everything out for you including the time the machine takes to execute the sort. You don't have to provide test strings because the program generates them randomly. Try it out with only a few strings to start with then double the number while noting how execution time increases rather simply each time.

Program 10.1A: Hex dump of Program 10.1

```

: 0000 38 A5 F8 8F 01 85 F8 80
: 0008 02 C6 FC 18 A5 3F 6F 0A
: 0010 83 3F A5 30 6F 00 85 5A
: 0018 A9 00 85 FF 85 F8 85 FE
: 0020 A5 5A 85 5A A5 5F 85 57
: 0028 18 6F 03 85 5F 70 02 E6
: 0030 5A A0 00 81 57 85 5F 81
: 0038 5F 85 60 08 81 57 85 58
: 0040 81 5F 85 50 08 81 57 85
: 0048 5C 81 5F 85 5E A0 00 81
: 0050 58 01 58 70 0F 00 1E 08
: 0058 C4 5F F0 1F C4 60 F0 04
: 0060 00 83 D0 A7 A0 02 84 FF
: 0068 81 57 A0 81 5F 71 57 8A
: 0070 71 5F 88 10 F3 E6 F0 04
: 0078 02 E6 FE A5 F8 C5 F8 80
: 0080 7F A0 F8 C5 FC D0 7F A8
: 0088 FF F0 13 A5 F8 38 8F 01
: 0090 85 F8 80 04 C6 FC A5 F8
: 0098 D0 C8 A5 FC D0 C4 60 0E
: ?

```

Understanding the source code

A flow diagram of the rather complex string comparison section of Program 10.1, is shown in Figure 10.1. Use it in conjunction with the following line by line treatment of the mechanisms.

Lines 30 to 110 assign labels to all used locations. All locations used for storage are in page zero.

Lines 120 to 160 subtract 1 from the two-byte quantity stored in NUMBER and NUMBER+1.

Lines 190 to 250 collect the array space start address which is always stored in locations 12F and 130. An offset of \$04 is added in order to point to the first element of the array. This also skips the array zero element which may contain an array header and thus will not normally be included in the sort. The result is placed temporarily in address pointer TWO (two bytes).

Lines 260 to 280 initialise the swap flag, FLAG; (1 byte) and the loop counter, COUNT (two bytes) to zero.

Lines 300 to 330 copy the contents of pointer TWO to pointer ONE (two bytes each).

Lines 340 to 360 increment pointer TWO by adding 1, because it must point to the next string information block three locations away.

Lines 390 to 430 use indirect addressing to fetch the length of the first string from the string information block. This data is stored in pointer ONE.

Program 18.1 Poking a hex dump into memory

```

10 REM POKING A HEX DUMP INTO MEMORY
20 REM STARTING AT ADDRESS 40000
30 INPUT "HOW MANY BYTES IN HEX DUMP?":N0
40 B=40100
50 FOR L=0 TO N0-1
60 READ D#
70 POC=ASC(D#)*16
80 SOC=ASC(RIGHT(D#,2))*16
90 IF POC>B THEN POC=POC-7
100 IF SOC>B THEN SOC=SOC-7
110 BTO=16+POC+SOC
120 POKE B+L,BTO
130 NEXT
140 DATA 00,00,00,00,00,00,00,00,00,00
150 DATA 00,00,00,00,00,00,00,00,00,00
160 DATA 00,00,00,00,00,00,00,00,00,00
170 DATA 00,00,00,00,00,00,00,00,00,00
180 DATA 00

```

lines 400 to 408 do the same for the second string. The data is stored in pointer TWO.

Lines 410 to 530 obtain the start addresses of the string pair, again using indirect addressing. The addressing are stored in the page zero locations STRPTR1 and STRPTR2 (two bytes each).

Line 540 clears the B register which doubles as the string character counter. Lines 550 to 580 compare the ASCII codes of the string character pairs. The entire string descriptors are swapped over if they are in ascending order. Otherwise, they are left alone.

Line 590 increments the string character counter.

Lines 600 to 610 compare the length of the first string LENGTH1 to the character counter. If they are equal, no swap is required.

Lines 620 to 630 compare the second string length LENGTH2 to the character counter and, if equal, a swap is made. Line 640 forces a branch back to 54000 simply for comparing the ASCII codes of the next pair of string characters. This cycle continues while neither of the above comparisons has resulted in a swap or a no swap branch.

Line 650 is an out-of-range branch patch. It is due to the limit on displacement imposed by relative addressing which would have been exceeded in line 960. This method is an alternative to using an absolute JMPF which would cause problems if the object code were to be relocated.

Line 660 stores 1 in the Y register. This acts as a byte counter and also as an index register for indirect indexed addressing.

Line 670 sets the swap flag. Any nonzero value stored in the location labelled FLAG indicates that a swap has taken place.

Lines 680 to 730 swap the 4-byte string descriptors, one byte at a time, using the X

index register as a temporary intermediate storage location.

The remaining lines 740 to 970 are similar to lines 500 to 740 of the integer sort array given last month.

Using the routine

It is important to remember that, in use, the string array to be sorted must be the first Dimensioned in BASIC. This is because the start address, of the array to be sorted, is calculated from the start of the array space (used by the Commodore 64) locations 520 (low byte) and 530 (high byte). If the above is not adhered to the sort routine will simply not work.

The final code is present in memory from 40000 (40100 decimal) onwards.

In order to use it all we need supply is the number of array elements to be included in the sort. For example, say that the total number of strings stored in the array is placed in the variable IF#. The following two lines of BASIC will split that number into a high byte and low byte component ready for POKEing into locations 948 and 949 (157 and 254 decimal).

```

1000 H%=IF#/256
2000 L%=IF%-H%*256

```

The values are POKE'd with the following two lines:

```

30 POKE 251,L%
40 POKE 252,H%

```

Finally, the routine is called from BASIC by: SYS 40100

Table 10.1 is a general guide to the sorting speed to be obtained for various random length strings. The table reveals that it takes approximately four times as long to sort double the number of strings.

Figure 18.1 Flow diagram of string comparison

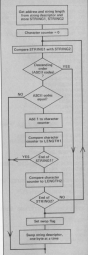


Table 10.1

No of random strings	Typical sort time
100	1 sec
200	4 sec
400	8 sec
600	13 sec
800	23 sec
1000	35 sec

There are, of course, more efficient algorithms but few use less memory. For those interested in even faster methods using the 'diminishing increment sort' algorithm see our books 'Advanced machine code programming for the Commodore 64' or 'Filing systems and databases for the Commodore 64' published by Granada Collins.



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Special effects

A very important facility in the performance of a synth sound is that of glide (sometimes called portamento, goodness knows why). This means when you play note the next note glides smoothly up to correct pitch rather than steps up to it. Let me demonstrate: This program renders a gliding note from C in the 4th octave to C in the 5th octave.

Address	128	64	32	16	8	4	2	1
\$4276								
\$4283	Noise	pulse	slow	tri	test	ring		sync
\$4286						mod		
Table 1								

It is done by incrementing the pitch by very small amounts, so the steps aren't audible. To hear the steps, just put in a delay:

DS FOR (=) 50:100:ND32

... and now you can hear the stepping quite clearly. Glide is used to great effect in computer music, adding a touch of humanity (sweetness) to otherwise digital (stuffy) sounds.

Now some difficult bits

Hidden deep within the heart of each oscillator on the SID lie a few very sophisticated controls. See Table 2.

Synchronisation, or sync, effects can give you some wonderful synth tones. One oscillator's waveform is modulated with another, the fundamental frequencies of the first being made to conform to the second's. This gives you some very rich harmonic blends, and although the pitch stays the same the harmonic content alters, giving you an enormous range of tone 'colours'. Sync for Osc 1 resides in address \$4276 and to activate it you POKE \$4276,1.

Ring modulation, or ring mod, is perhaps best known for being the effect on a Dalek's voice. Fortunately it's use in synthesis and music tend to be a little less disturbing! Ring mod is primarily used in the creation of realistic bell or gong tones: a ring modulator takes two frequencies and outputs a compound of the sum of the two frequencies (pitch), and the difference between them. The result is a waveform whose harmonics are not related (they are normally), producing highly delayed metallic tones

qualities. A sample input/output might be like this:

Frequency 1 = 502.10Hz
Frequency 2 = 164.89Hz

Yield = 164.89 + 502.10 = 1067.14Hz
= 502.10 - 164.89 = 337.21Hz

In order to use ring mod on Osc Two must select both triangle and ring mod; ring mod modulates the triangle wave of Osc 1 with the output of Osc 2. Really the best way for you to learn all about ring mod is to mess about with it, so try: POKE \$4276,16;ND32

Give it a whirl and see what you can come up with.

Mostly, ring modulated waveforms contain all manner of unwanted harmonics which degrade the sound

whereby you can use the filter in the SID's synth to filter an external instrument's output! Interesting though it is, it really shouldn't be used without expert advice; you can blow up the chip if you're not careful!

Filter type/volume: \$4296

The first four bits govern the overall volume of the system in a scale of sixteen values, from 0 (not a sausage) to 15 (blasting your speakers off). The next three bits select filter type: hi-pass, lo-pass and band pass. Hi-pass lets high frequencies through, lo-pass lets low frequencies through and band pass lets frequencies at and either side of the cut-off point through and stops those further away. (There is actually another type of filter available if you add hi and band pass together - band reject) or notch. This is the exact reverse of band pass, letting through all frequencies save the ones at the selected cut-off.) The last bit in this register is Osc 3 ON. Oscillator 3 can be very useful as a modulator for the other two, and in this case the output from 3 might be undesirable (noisy rubbish), so this gives us the option to toggle its output off.

The sophistication of the SID's filter is the one thing which sets the 64 apart and shrouds above other micros, synthesiser-wise. It gives you power over an enormous range of beautiful sonic

quality. To clean them up you need to filter the sound.

Filter tips

With inspiration in my heart, it is my solemn duty to lead you by the nose into yet another table, this time the registers

	128	64	32	16	8	4	2	1
\$4285	-	-	-	-	-	FC1	FC1	FC8
\$4284	FC10	FC9	FC8	FC7	-	FC5	FC4	FC3
\$4285	8153	81	8033					
\$4286	8153	8152	8051	8150	EXT	OSC3	OSC2	OSC1
\$4286	8C4F	8F	8F	LF	VO13	VO12	VO11	VO10
Table 2								

governing the filter. See Table 3.

The registers hold as follows:

Filter cut-off: \$4285 and \$4286

Register \$4285's last five bits (right to left, the dashed item) used, the remainder plus \$4286 are the filter cut-off values, and as with previous registers, you can use them alone or added together to get FC10 = FC8 + 128+32 = 168). These bits don't control the cut-off point or the frequency of the filter; they are a reference point and the effect they cause is due entirely to the type of filter selected. (See Filter Type/Volumes.

Resonance/Filter: \$4296

Resonance affects the frequencies around the cut-off point, emphasising them and making them brighter. The first three bits (right to left) of this register govern which Oscillators go through the filter. The fourth bit is very interesting. This is the external input to the filter,

textures and tone colours, which brings me to our last section, with some tips on Imitative Synthesis.

Is it real, or is it... synthesised?

Imitative synthesis is the art (or in some cases science) of imitating natural sounds or conventional instruments. This is a controversial topic, as synths can imitate any instrument, with intelligent programming, and you're telling that to the Musicians Union: they'd smash your face in! Synthesiser, and Computer keyboards generally, are seen to be doing for the number of working musicians what the advent of computers did to the number of working accountants. Personally, I don't think musicians have anything to worry about: nothing sounds as good as a real instrument played well by a real person.

And, next month, I'll include some hints and tips on how to imitate all your favourite instruments.

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Mike Hart explores
one of the most
frequently demanded
programming
routines: the ability
to flash a message on
the screen or to flash
the whole, or part of
the screen, on or off.

THE MOST COMMON USE of flashing is that of prompting the operator to take some action by flashing a message several times on the screen.

In the little program called BASIC-FLASH, notice that A\$ is initialised to a message in line 20 and a delay constant defined in line 30.

The main FLASH sub-routine (1000-1050) prints the message, estimates a delay loop, estimates the message and activates a similar delay loop. If no key is pressed, the whole sub-routine is re-entered until any key press generates a RETURN. The crucial line is probably line 1030 which is merely a cursor up (CHR\$(8)) followed by a blank line and terminated by another cursor up. This technique, or rotation back around 8, will work on any Commodore machine.

Commodore 80 owners might like to try the following 'line liner' which provides a quick and handy 'screen-dialer'.

```
100 GOTO 255: POKE 10270:
NEXT I
```

The following technique is usually used to flash the screen. First of all, get the character from the screen and then EXCLUSIVE-OR it with 60/00000001 - i.e. flip bit 7 from a 1 to a 0 or vice versa that's giving 'normal' or 'inverted' graphics. Then put the new character back into the same position. In earlier versions of the Commodore's, the colour must also be XOR'd back to the screen.

Either the whole screen, or just particular sections of it, can be reversed. With 1000-1050,

RELIABLE ROUTINES

to the screen and the colour memory map, this would take an eternity in BASIC.

The machine code routine, REVERSE-FLASHER, compresses the long wait if the sub-routine is called once only, then a certain portion of the screen is reversed; if a delay loop is built in and the process repeated several times, you can get the flashing effect you desire.

Your first task in REVERSE-FLASHER is to decide where to flash the code - I have placed it in the custom buffer-out of force of habit but it can go into safe locations. SCREEN(4095) is a good place if not occupied by anything else and if you make variable IN (LOCATION) in line 10 the starting point of your code.

Next, three parameters are

provided: INK (the character colour); PAPER (the background colour) and the number of lines (starting from the top of the screen). The device is set up so that INK is black, PAPER is grey 2 and the number of lines is set to 10. To flash the whole screen the number of lines would be 25.

The routine saves the current character colour and background colour and then restores them after the flash. The 'new' flashing effect is obtained if the initial paper colour is maintained throughout: this is because, if you change the PAPER colour, the

whole screen is changed to that colour while the first n lines will flash. The delay loop may be shortened or lengthened or even cut out altogether. The length of the whole flash can also be controlled in a similar fashion by adding the real value of the I loop to line 80.

It is best to experiment with this routine until you find an effect which suits you best.

Finally, a machine-code demonstrator is provided, for those readers who like to study such things, to see how they work and also improve them if necessary.

Happy flashing!

Program Listing

```
1 REM *** REVERSE..FLASHER ***
2 :
3 REM ** MIKE HART **
4 :
5 REM SYNTHESIS LOC'D: INK,PAPER,LINES
6 :
10 LPRINT INK;"PAPER=";PAPER;"LINES=";L
15 :
20 FOR J=0 TO 87: READ H
30 T=TIME:POKE L+J,0:WAIT
40 READ CH: IF CH#T THEN GOTO 30
50 PRINT"DATA ERROR!"&END
60 PRINT"PRINT TO 8."
65 :
70 REM *** SEND ONLY ***
75 :
80 FOR J=1 TO 50:SYNCLINE INK,PAPER,LINES
90 FOR CL=1 TO 25:WAIT (L+J)*T
95 :
100 DATA 170,10,000,100,000,170,100,0
101 DATA 100,000,100,000,100,000,100,000,100,000
102 DATA 00,001,100,100,00,000,00,100
103 DATA 0,100,0,000,100,0,000,100
104 DATA 0,000,100,0,000,000,000,001
105 DATA 100,100,100,0,100,001,100,0
106 DATA 100,000,100,00,100,00,100,00
107 DATA 100,001,100,10,000,000,000,10
108 DATA 00,000,00,100,001,100,000,100
109 DATA 000,000,000,100,000,000,000,101
110 DATA 00,000,100,000,001,000,0,000
111 DATA 0000
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```

READY.

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READY.
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JUMP JET

CBM 64
CASSETTE £9.95
DISK £11.95



Written by
Vaughan Dore
Jump Jet Pilot

Every pilot has the dream of flying one of these unique and versatile fighting machines. This is your chance to do what few pilots have the privilege to try.

Depending on your skill, confidence and courage, you have the choice of remaining near the landing pad, learning to hover and land, or venturing higher to practice your approaches. When you think you have mastered these, then accelerate the Jump Jet into an attack fighter. Use the radar and range finder to seek and destroy the enemy, by launching heat seeking air-to-air missiles. However! This radar and missile systems are as good as yours. Realistic pursuit is all advised; you must maintain a fast level that will enable you to relocate and return to the aircraft carrier, securing the skills you have learned to achieve a successful landing.

You are now ready to proceed to the next skill level to face additional hazards, such as unpredictable wind and treacherous cross winds.

Be warned, this program is not a toy or game. You will need to co-ordinate your hands, eyes and mind to successfully complete each mission. Do not hope to achieve in a short time that which took the author three years to learn as a Jump Jet pilot, and over a year to record on this computer program.



ANIROG

Choosing the right computer is a good start — but can you find the right software?



At SUPERSOFT we're very conscious of the fact that people who spend several hundred pounds on computer equipment are looking to do rather more than play 'Space Invaders'.

Financial planning is a rather grand name for something you've been doing all your life — making ends meet! Perhaps if Mr Micawber had used **BASICALC** he would have been able to balance the books a little better.

For home, club or small business use **BASICALC 3** should pay for itself in no time at all; for larger companies we recommend **BASICALC 3**, one of the few really valuable programs that you can learn to use in a day.

Although your Commodore 64 is a powerful musical instrument, you need to hit a pretty good programmer to understand how it all works. Unless, of course, you buy **MUSIC MASTER**.

To use **MUSIC MASTER** requires no prior musical knowledge, though in the hands of an experienced musician it will prove an invaluable tool. You don't need to know the first thing about programming either! **MUSIC MASTER** is the musical equivalent of a word processor, remembering the notes you play and allowing you to replay and edit them as you wish.

INTERACTION PILOT is a space flight simulator. Nowadays simulators are widely used to train pilots and astronauts because — to be frank — it's a lot cheaper (and safer) than the real thing!

Imagine, if you will, life in the 23rd century: space travel is commonplace, and on the outskirts of the galaxy the first war between civilisations is being fought. A shortage of trained pilots has prompted the Federation to develop a computer simulation that allows new recruits to gain experience without paying for their mistakes with their lives. With the aid of your Commodore 64 you too can learn to pilot the Intrepid 441. It's not too weird — this is no game!

Other SUPERSOFT products include the **MINI80 ASSEMBLER** cartridge, the only assembler that's ideal for beginners yet powerful enough for the professional (most of our competitors use it!). The **VICTRON** cartridge adds dozens of commands to Basic including toolkit aids and disk commands; or an disk their **MASTER 64**, a really comprehensive package for the keen programmer.

Of course, we do also publish games programs, and with titles like **STIX**, **QUINN** and **KAMB-KAZ!** in our range we are one of the market leaders. But we most enjoy coming up with the sort of programs that are going to be in use for months and years, not hours and days — the sort of programs that make you glad that you bought a computer — and glad that you bought SUPERSOFT!

You won't find SUPERSOFT products on the shelves of your local supermarket. But most specialist shops stock titles from our extensive range (and are prepared to obtain other programs to order). However you can also buy direct by sending a cheque (pre-paid orders are post free), by calling at our offices, or over the telephone using your ACCESS card.

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SUPERSOFT, Winchester House, Canning Road,
Winchester, Hants, WIMBORNE BA1 7JQ
Telephone: 01963 1588